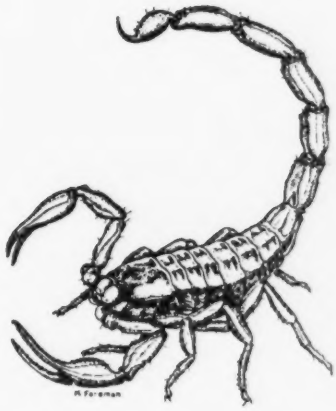
THE SOUTHWESTERN NATURALIST



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THE SOUTHWESTERN NATURALIST 6 (2): 55–64 SEPTEMBER 1, 1961

ADDITIONAL INFORMATION ABOUT BLIND CATFISHES FROM TEXAS[1]

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ABSTRACT. Two additional specimens of *Satan eurystomus* Hubbs and Bailey and one additional specimen of *Trogloglanis pattersoni* Eigenmann are described. New evidence on relationships is also presented.

Previously only two specimens of *Trogloglanis pattersoni* Eigenmann and one specimen of *Satan eurystomus* Hubbs and Bailey have been described in the literature (Eigenmann, 1919: 398–400; Hubbs and Bailey, 1947: 1–15). In a more recent paper, Carranza (1954: 129–136) described another blind species, *Prietella phreatophila*, from northern Mexico and included a tabular comparison of the three North American genera.

I wish to thank Mr. John E. Werler for obtaining one specimen each of *Trogloglanis pattersoni* and *Satan eurystomus* from a deep well (nearly 2000 feet) on the O. R. Mitchell ranch, Von Ormy, Bexar County, Texas, approximately 14 miles southwest of San Antonio. The date of collection is not known but the specimens were received at Tulane University in 1955. Thanks are due Dr. Bruce B. Collette for obtaining an additional specimen of *Satan eurystomus*. This specimen, United States National Museum no. 195830, was obtained about June 1, 1960, from a recently drilled well (1400 feet deep) near the Patio Foods plant at 2600 S.W. Military Drive, San Antonio, Bexar County, Texas. The San Antonio News reported that about a dozen blind catfish and several dozen fresh-water shrimp came out of the well during the initial flow.

Satan eurystomus Hubbs and Bailey. Figure 1 and 3 (upper)

The widemouth blindcat was described in detail by Hubbs and Bailey (1947) and so there is little to add to the general description of the form. Most of the measurements given by the above authors for the type of *S. eurystomus* were also determined for the two recently acquired specimens. These data are presented in Table 1. Both of the spcimens, TU 10809 and USNM 195830, are larger than the "type." The former specimen, TU 10809, has the mouth open, a broad abrased

[1] Partially supported by NSF G-3882 and NSF G-9026.

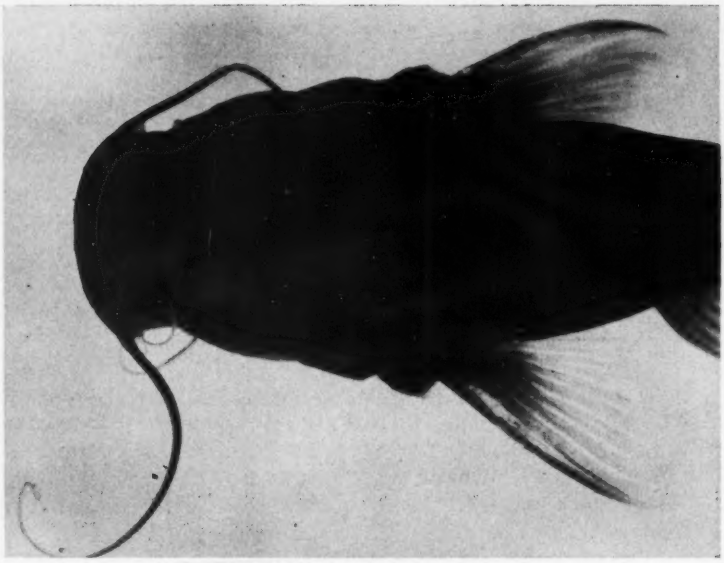

Fig. 1. Dorsal view of *Satan eurystomus* (TU 10809).

area on the right side immediately behind the pelvic and first dorsal fins but has all the fins intact. The caudal fin is emarginate as shown in reconstructed form in the illustration of the type (Hubbs and Bailey, 1947: Figure 1). The latter specimen (USNM 195830) has an emaciated body and frayed fins, presumedly a result of the period of captivity in the San Antonio Zoo before death and preservation.

Both recently acquired specimens have 1 spine and 6 branched rays in the dorsal fin; whereas the type has 7 branched rays. The type has 6 unbranched and 14 branched rays in the anal fin; the Tulane and the National Museum specimens have 6, 14 and 4, 15 respectively. Both specimens have the same number of principal caudal (17) and pelvic (1 simple, 9 branched) rays as the "type." The Tulane University specimen has 11 branched rays in the left pectoral and 10 in the right. The United States National Museum specimen has 10 branched rays in each fin as does the "type." The two recent specimens have a lower gill raker count than the "type" (4 + 15). The Tulane specimen has 5 + 13 and the National Museum specimen has 5 + 12. They have fewer branchiostegals; both specimens have 11 on each side, but the "type" has 10.

The number of lateral line sensory tubes and pores is different in some series than enumerated for the "type." The recently acquired

specimens each have 21 operculomandibular pores. If the anterior pore on the mandible is counted as two as done by Hubbs and Bailey (1947: 8) then the count is 11 for each side which is still one less than the count of the "type." The Tulane specimen lacks an opening to the surface for the termination of the short postorbital tube of the left side. The National Museum specimen has an extra interorbital pore on the left side, there being 2 instead of one. The number of separate tubular sections of the anterior lateral line system apparently is quite variable; the Tulane specimen lacks tubes on the left side and has only a single tube on the right side but the National Museum specimen has 6 separated tubes on left side and 4 on the right. These two recent specimens have the same number of pores as the "type" in the lateral head, infraorbital, nasal and prenasal pore series.

Hubbs and Bailey (1947: 11) did not describe the peculiar structure of the pectoral spine of *Satan*. The pectoral spine as described for *Prietella* by Carranza (1954: 131) is similar to that of *Satan*. Presumably the segmented condition of the distal two thirds represents a primitive condition, i.e., a failure to fuse into a solid spine like that of the typical surface living ictalurids. The distal segments of the spinous pectoral ray overlap similarly to the fulcra on the fins of garfishes.

The Tulane specimen of *Satan eurystomus* has 40 vertebrae (based on the assumption that the complex anterior to the first vertebrae with typical ribs is composed of five vertebrae) and the National Museum specimen has 42.

Trogloglanis pattersoni Eigenmann. Figure 2

Measurements for the single specimen, TU 10808, are given in Table 1. There is one spine and 6 soft rays in the dorsal fin; 4 unbranched and 12 branched rays in the anal fin; 17 principal caudal rays; each pectoral has 1 spine and 9 branched rays; and each pelvic fin has 1 simple and 7 branched rays. The dorsal fin, although reduced to a stub from an injury, thus making the counting of rays difficult, probably has 6 soft rays—which is one more than reported by Hubbs and Bailey for their specimen. The Tulane specimen has 5 + 14 gill rakers; 9 branchiostegals on left side (right, not determined); 10 operculo-mandibular pores on each side; a postorbital pore only on right side; 5 left infraorbital pores and 6 right; 1 interorbital on each side; 2 nasal pores on each side and 1 prenasal on each side; and 37 vertebrae (inclusive of 5 in complex).

RELATIONSHIPS

There is additional evidence to support the belief of Hubbs and Bailey (1947) that *Satan* and *Pylodictis* are evolved from a common

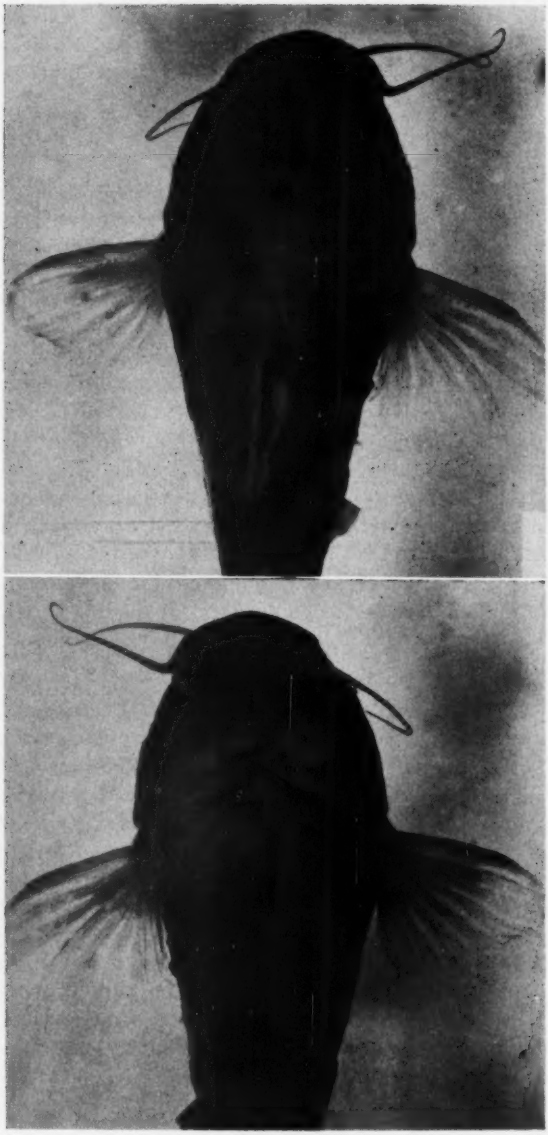

Fig. 2. Dorsal (upper) and ventral (lower) views of *Troglogianis pattersoni* (TU 10808).

Fig. 3. (upper) X-ray photograph of *Satan eurystomus* (TU 10809) (X-ray No. 509); (lower left) Neurocranium of *Ictalurus furcatus* (TU Osteology Coll. No. 225); (lower right) Neurocranium of *Pylodictis olivaris* (TU Osteology Coll. No. 209). (both scales are metric and numerals represent centimeter units).

Fig. 4. Neurocrania and associated bones of: (upper left) *Ictalurus natalis* (TU Osteology Coll. No. 204); (upper middle) *Ictalurus melas* (TU Osteology Coll. No. 197); (upper right) *Ictalurus punctatus* (TU Osteology Coll. No. 212); (lower left) *Noturus flavus* (TU Osteology Coll. No. 168); (lower middle) *Ictalurus dugesi* (TU Osteology Coll. No. 205); (lower right) *Ictalurus lupus* (TU Osteology Coll. No. 190). (All scales are metric, numerals indicate centimeter units).

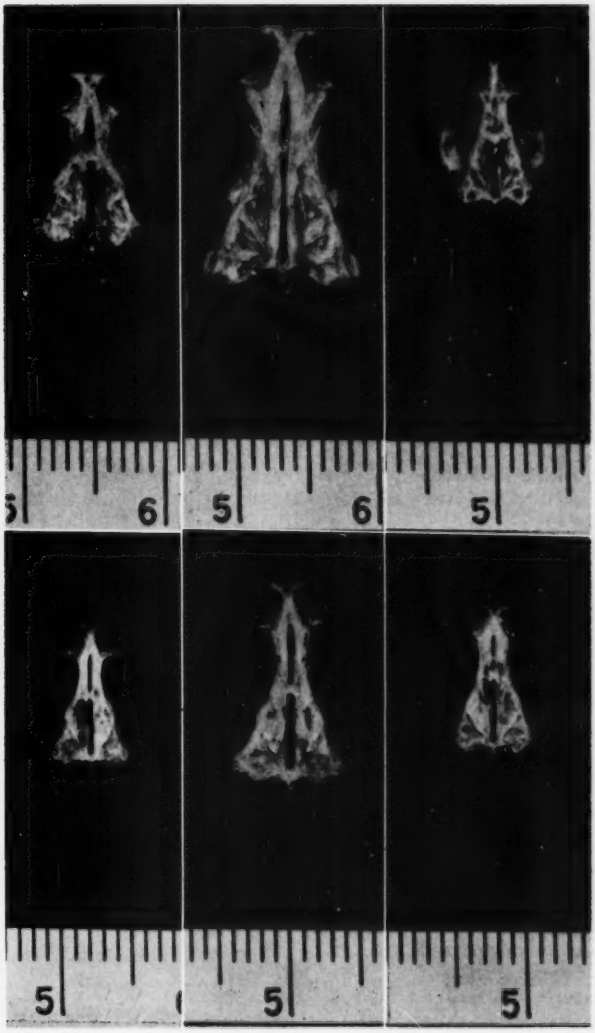

Fig. 5. Neurocrania and associated bones of: (upper left) *Noturus gyrinus* (TU Osteology No. 161); (upper middle) *Noturus funebris* (TU Osteology Coll. No. 172); (upper right) *Pristella phreatophila* (TU Osteology Coll. No. 178); (lower left) *Noturus hildebrandi* (TU Osteology Coll. No. 154); (Lower middle) *Noturus miurus* (TU Osteology Coll. No. 159); (lower right) *Noturus leptacanthus* (TU Osteology Coll. 185). (all scales are metric, numerals numerals indicate centimeter units).

TABLE 1

Proportional measurements of Satan eurystomus *and* Trogloglanis pattersoni *from near San Antonio, Texas, expressed as thousandths of the standard length*

Measurement	*Satan eurystomus* TU 10809	*Satan eurystomus* USNM 195830	*Trogloglanis pattersoni* TU 10808
Standard length (mm.)	77.3	88.0	68.6
Body depth below dorsal origin	196	168	208
Body depth above anal origin, to top of adipose	168	139	250
Caudal peduncle depth (over-all)	112	88	141
Caudal peduncle length	144	161	179
Predorsal length	367	339	355
Length to adipose origin	640	616	639
Dorsal base	124	126	115
Interdorsal distance	89	165	183
Adipose fin, basal length	283	262	316
Adipose fin, length to tip	292	288	329
Adipose notch to caudal base	122	115	119
Anal origin to caudal base	377	373	339
Anal base	249	216	179
Pelvic insertion to anal origin	142	168	167
Length to pelvic insertion	508	468	523
Anus to anal region	58	51	62
Dorsal fin height	261	259	. . .
Dorsal spine length	128	186	. . .
Longest dorsal ray	239	221	. . .
Adipose fin, vertical height	65	47	80
Caudal fin length			
to upper angle	271	210	247
to end of shortest ray	213	174	220
to lower angle	254	202	246
Anal fin, depressed length	284	291	246
Longest anal ray	177	162	196
Pelvic fin length	183	173	155
Pectoral fin length	222	220	231
Length first pectoral branched ray	219	224	224
Between pectoral insertions	239	221	266
From inside of shoulder girdle to tip of humeral process	59	57	39
Between pelvic insertions	124	106	116
Between pelvic fins	24	27	21
Head length	342	316	307
Head width	244	229	281
Head depth at occiput	184	153	186
Length of barbels			
Nasal	84	57	196
Maxillary	433	381	176
Outer mental	157	181	100
Inner mental	107	107	74

TABLE 1—Continued

Measurement	*Satan eurystomus* TU 10809	*Satan eurystomus* USNM 195830	*Trogloglanis pattersoni* TU 10808
Distance between posterior nostrils	89	78	72
Snout to posterior nostril	84	76	83
Premaxillary tooth patch			
Length	10	9	...
Width	131	126	...
Dorsal origin to occiput	78	77	64
Dorsal origin to caudal base	667	671	686

origin. They mentioned the broad, flattened head as an external similarity but the internal structure is even more convincing. *Pylodictis* is the only surface-living ictalurid which has a broadly forked dermethmoid (Figure 3, lower right). Smith (1956) examined numerous species of *Ictalurus* (12) and *Noturus* (12) and all have a small medial depression or notch at the anterior end of the dermethmoid unlike that of *Pylodictis* (Figures 3, 4 and 5). *Prietella* (Figure 5, upper right) and *Trogloglanis* resemble the members of the genus *Ictalurus* especially *I. melas* (Figure 4, upper middle) in the shape of the dermethmoid and so, contrary to Carranza (1954: 132), I believe *Prietella* is more closely related to *Ictalurus* than to *Satan* and *Pylodictis*. A comparison of vertebral counts does not add much supporting data for any of the assumptions above. In a sample of nine specimens of *Pylodictis* from Texas, three have 51 vertebrae, four have 52 and two have 53, and as mentioned above the two specimens of *Satan* have 40 and 42 vertebrae. The Tulane specimen of *Trogloglanis* has 37 vertebrae and of ten paratypes of *Prietella*, nine have 36 vertebrae and one has 37. Surface-living ictalurid catfishes occurring presently in Texas and closely surrounding area have a variable number of vertebrae. The black bullhead, *Ictalurus melas*, in the Louisiana area has a vertebral count which ranges from 40 to 43. Fourteen specimens have the following distribution of the number of vertebrae: two specimens have 40 vertebrae, eight have 41, three have 42 and one has 43. The blue catfish, *Ictalurus furcatus*, has 50 to 53 vertebrae in the Lake Pontchartrain, Louisiana area. The channel catfish, *Ictalurus punctatus* from New Orleans, Louisiana, has 47 or 48 vertebrae. *Noturus miurus* from Homochitto River, Franklin Co., Mississippi has 40 to 42 vertebrae. *Noturus hildebrandi* from the same locality (Homochitto River) has 38 or 39 vertebrae. Thus both *Trogloglanis* and *Prietella* have a lower vertebral count than the above mentioned surface-living forms which presently occur in Texas; however I would not speculate that subterranean forms have a reduction in the number of vertebrae until more data are available.

The dermethmoid of *Rhamdia*, a pimelodid catfish from Nicaragua, is similar to that of *Prietella* and *Trogloglanis*, however *Rhamdia* has only three pairs of barbels. The adipose fins of *Satan* and *Pylodictis* are more dissimilar in shape than those of *Rhamdia* and *Satan*.

Just how much importance should be assigned to each internal and external character is difficult to say. The shape of the dermethmoid is emphasized in this paper because a depressed head does not necessarily preclude any other type of dermethmoid than a broadly forked one. Various species of *Noturus* have flattened heads and the neurocranium is much depressed, e.g., *Noturus flavus* has a depressed neurocranium, but does not have a broadly forked dermethmoid (Figure 4, lower left).

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THE SOUTHWESTERN NATURALIST 6 (2): 65–72 SEPTEMBER 1, 1961

THREE NEW SPECIES OF TEXAS WEEVILS (COLEOPTERA, CURCULIONIDAE)[1]

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ABSTRACT. Three new species of weevils collected in Texas are described: *Endalus depressus*, most closely related to *Endalus laticollis* Blatchley from Florida; *Nanophyes vesperus*, assigned to the subgenus *Zeugonyx* with *Nanophyes sabinae* (Notman); and *Rhyssomatus fissilis* which most closely resembles *Rhyssomatus nigerrimus* Fahraeus. A key to the North American species of *Nanophyes* is included.

The following new species are described at this time to make the names available for use in a forthcoming paper on the Curculionidae of Texas.

Sincere thanks are due the following persons for loan of material and for other favors: Miss Rose Ella Warner, Entomology Research Division, U.S.D.A. (U.S. National Museum); Dr. Leland Chandler, Purdue University; Dr. Henry F. Howden and Mr. W. J. Brown, Canada Department of Agriculture (Canadian National Collection); and Mr. R. T. Thompson, British Museum (Natural History).

The holotypes, and all paratypes except where otherwise noted, of the species described herein are deposited in the Collection of the Department of Entomology, A&M College of Texas.

Endalus depressus, new species. (Fig. 5)

Holotype male: Length (from anterior margins of eyes to apices of elytra), 2.9 mm.; width (across elytra), 1.3 mm.; width of prothorax, 1.2 mm.; length of prothorax, 0.9 mm.; length of rostrum, 0.6 mm.

Body rather strongly depressed; derm piceous, legs and antennae reddish brown; with dense vestiture of scales which are uniformly gray except for darker ones forming patterns on pronotum and elytra. *Rostrum* stout, feebly, evenly curved, two-thirds as long as prothorax, very coarsely punctate at base with punctures becoming finer and more remotely spaced toward apex. Suprascrobal groove deep, well defined throughout, lined with scattered oval, white scales. *Antenna* rather stout, attached just slightly in front of middle of rostrum; scape

[1] Technical contribution No. 3696, Texas Agricultural Experiment Station, A&M College of Texas, College Station.

not quite reaching eye; first funicular segment subequal in length to next four segments combined, its apex with fringe of white scales, segments 2–6 approximately equal in length, each as wide as long, the outer ones becoming progressively broader toward club; club elongate oval, covered with recumbent scales and scattered, suberect setae. *Eyes* transverse, height equal to twice width. *Head* closely, coarsely punctate beneath dense covering of scales; front with feeble transverse impression above eyes. *Prothorax* just slightly narrower than elytra; sides parallel in basal half thence converging to near apex from which point they are abruptly narrowed to subapical constriction; pronotum moderately convex, densely, coarsely punctate, with faint transverse impression before apex; disc of pronotum with dark, indistinctly defined, quadrate area which encloses a white spot at base immediately in front of scutellum. *Scutellum* small, oval, squamose. *Elytra* slightly emarginate at base; humeri oblique, very feebly rounded, not at all prominent; sides of elytra parallel in basal half thence each converging gently into a slight emargination before apex; elytral intervals flat, each bearing a row of pale, recurved, remotely placed setae; striae fine, deeply impressed throughout; elytral scales gray except for dark brown ones forming a sutural vitta on the basal third of the first interval, and a few oblong spots on other intervals near beginning of declivity. *Ventral side* with dense coating of scales like those above, and bearing scattered, pale, recurved setae; broad, shallow concavity in middle of first abdominal sternum extends on metasternum, sternum 5 with a feeble depression in center. Legs moderately stout, covered with dense coating of scales and scattered, recurved setae; the setae on tibiae longer, more abundant and more nearly erect than those on femora; tibiae roughly sculptured beneath scales, straight, each with a stout apical spine and a short, rather inconspicuous preapical tooth, fore tibia with a row of small denticles along inner margin, these denticles present only near apex of middle tibia, absent on hind tibia. Tarsi stout, squamose, second segment distinctly broader than first, third deeply biolobed, fourth segment small and projecting but slightly past lobes of third; claws divergent.

The female allotype closely resembles the holotype but is smaller (length, 2.4 mm.), and the rostrum is more shining and less densely and coarsely punctate.

Holotype male, 10 mi. S.W. of Elkhart, Anderson Co., Texas, VI–10–1960 (H. R. Burke), allotype female with same data except it was collected V–10–1959. Seventy paratypes (33♂♂, 37♀♀) with same data as holotype except collection dates range from VIII–31–

1958 to VII–23–1960, to be deposited in Texas A&M College Collection, U. S. National Museum, Canadian National Collection, Purdue University and British Museum (Natural History).

The members of the paratype series agree rather well with the holotype but vary considerably in size (range in length, 2.0–3.0 mm.), and in some examples the sides of the prothorax are subparallel and more evenly rounded anteriorly. All of these specimens were collected while sweeping low, mixed vegetation around a small farm pond. The distribution of this species appears to be rather localized since collecting in similar habitats in other areas of Anderson County, as well as in many other localities in Texas, has failed to produce additional specimens. However, one U. S. National Museum specimen (not included in type series) seen from New Orleans, Louisiana, definitely belongs to this species.

Endalus depressus was reported from Texas (Burke, 1959) as *Endalus laticollis* Blatchley. This record was based on Texas material compared with two Florida specimens of Blatchley's syntype series of *E. laticollis*. Later examination of the entire syntype series of five specimens of *E. laticollis* and additional examples from Florida indicates that the Texas specimens are not conspecific. *E. laticollis* is known only from Florida. These two species belong in the *ovalis-laticollis* Group (Burke, in press) and may be separated from other members of this group by the prothorax being almost as wide as the elytra, the depressed body, and the elytra being strongly tapered apically. One other apparently undescribed species in this group resembles *E. depressus* and *E. laticollis* by the wide prothorax but differs from these two by being much more robust and having the elytra broadly rounded at the apex. *E. depressus* and *E. laticollis* appear to be very closely related but may be separated as follows:

Endalus depressus—Length, 2.0–3.0 mm. Most specimens in the type series may be separated from *E. laticollis* by the larger size, but a few intermediates are at hand. The elytral scales are rather uniformly gray; they are never strongly mottled with darker scales. The dark sutural vitta behind the scutellum includes only the basal third of the first interval and sometimes part of the second interval of each elytron, but never extends laterally to the sixth interval.

Endalus laticollis—Length, 1.7–2.2 mm. The gray scales of elytra are strongly mottled with darker scales. The dark sutural vitta at base of the elytra has an arm extending obliquely forward to reach the sixth interval of each elytron. The same elytral pattern is present on all specimens of *E. laticollis* examined, although it is sometimes faint.

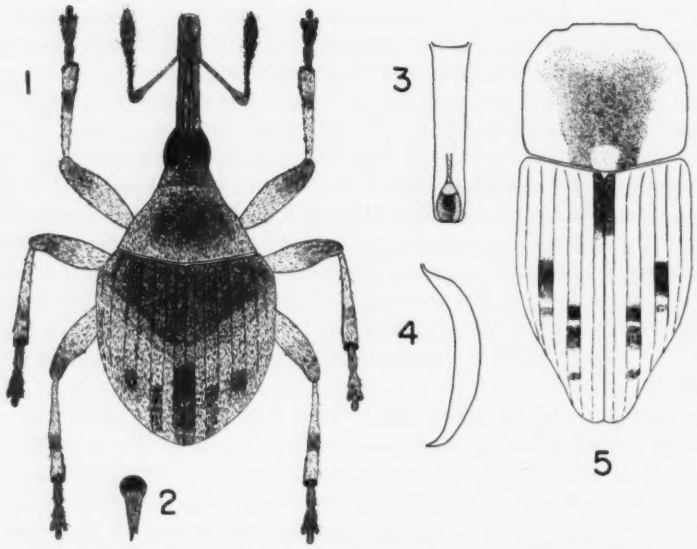

Fig. 1. ***Nanophyes vesperus*** **n. sp., male holotype. Fig. 2. Unequal tarsal claws of same. Fig. 3. Dorsal view of medium lobe of male genitalia,** ***Rhyssomatus fissilis*** **n. sp., paratype. Fig. 4. Side view of same. Fig. 5. Dorsal view of prothorax and elytra of** ***Endalus depressus*** **n. sp., male holotype.**

Nanophyes vesperus, new species. (Figs. 1, 2)

Holotype male: Length (from anterior margins of eyes to apices of elytra), 1.9 mm.; width (across elytra), 1.2 mm.; length of prothorax, 0.55 mm.; width of prothorax (at base), 0.9 mm.; length of rostrum, 0.55 mm.

Oval, robust; derm shining, alutaceous; rostrum, head, and prothorax, except for testaceous apical and basal margins of latter, black. Antenna with scape, funicle and basal segment of club reddish brown, outer segments of club darker. Elytra black in a large, triangular basal spot, dusky along lateral margins, testaceous elsewhere. Ventral side dark brown to black; femora and tibiae testaceous at base, darker apically; tarsi black. Body rather uniformly clothed with fine white, pale yellow and golden brown, recumbent setae, the white ones forming a conspicuous V-shaped fascia on elytra. *Rostrum* nearly straight, depressed in apical third; basal two-thirds tricarinate, sulcate, well defined median carina extending from base to point just behind antennal attachments, this median carina is flanked on either side by a longer, slightly curved carina which gradually fades out before apex

of rostrum; rostrum sparsely clothed with white and yellowish appressed and suberect setae. *Antenna* attached immediately in front of middle of rostrum; scape reaching a short distance past anterior margin of eye, rather abruptly enlarged near apex; funicle 5-segmented, first segment stout, elongate, second more slender and subequal to first, segments 3–5 approximately equal in length, last two slightly broader, each funicular segment with a whorl of suberect, yellow setae; club elongate-oval, longer than funicle, segments loosely joined, last segment about equal in length to basal two combined, all bearing slender, suberect setae. *Eyes* broadly oval, narrowly separated above. *Head* shining, front between eyes densely clothed with long, yellowish setae. *Prothorax* conical, sides converging strongly from base to apex, base twice as wide as apex. *Scutellum* not visible. *Elytra* a little wider at base, and 2.5 times longer, than prothorax, with feebly raised, granulate basal margin; humeri broadly rounded; intervals feebly convex, striae deeply impressed; dark triangular spot at base of elytra enclosing humeri with sides converging to a point on suture at middle of elytra, the vestiture on this spot consists of scattered white setae at base with finer, golden brown setae elsewhere; a conspicuous, narrow, V-shaped fascia with vestiture almost entirely of white setae bordering hind margins of basal triangular spot; setae elsewhere on elytra golden brown except lines of white ones on intervals 1, 3 and 5 on declivity. *Ventral side* dark, rather densely clothed with long, narrow, appressed and slightly inclined setae. Fore coxae large, conical, contiguous, middle and hind coxae each separated by a distance equal to slightly less than the diameter of a middle coxa. First abdominal sternum short behind coxae, one-half longer at middle than sternum 2, lateral margins of sternum 2 extended posteriorly to cover edges of 3, sterna 3 and 4 short, sternum 5 longer, conical, strongly convex. Legs slender; hind femur armed beneath with a minute, almost imperceptible spine, fore and middle femora unarmed; tibiae straight, each with a dark band just beyond middle, tibial setae white, suberect, more abundant near apex. Tarsi slender, rather densely setose, third segment deeply bilobed, fourth narrow, extending well beyond lobes of third; claws connate in basal half, unequal in size, inner claw of each pair distinctly shorter and more slender than outer one.

Holotype male and one paratype female, 10 mi. S.W. of Elkhart, Anderson Co., Texas, VII–23–1960 (H. R. Burke). Both specimens were swept from low vegetation around a small farm pond at night. The female paratype differs from the holotype in that the claws are not as closely joined, the middle femora each bears a minute spine, the rostrum is more strongly tapered past the antennal bases, and the

fifth abdominal sternum is not as strongly convex. The paratype appears to be somewhat teneral so that the color is lighter and the pattern not as well defined as that of the holotype.

Nanophyes vesperus is assignable to the subgenus *Zeugonyx* on the basis of the unequal tarsal claws. It may be separated from the only other species of this subgenus, *N. sabinae* (Notman), by the characters given in the key below. The following key to the North American species of *Nanophyes* must be considered as preliminary since specimens of *N. sabinae* (Notman) and *N. obesulus* (Blatchley) were not available for study. The key characters for these two species were taken from the original descriptions (Notman, 1922; Blatchley, 1916) and from a paper by Kissinger (1956) on the synonymy of North American Nanophyinae.

KEY TO NORTH AMERICAN SPECIES OF NANOPHYES

1. Tarsal claws unequal, the inner claw of each pair being shorter and more slender than the outer one (subgenus *Zeugonyx*) 2
   Tarsal claws equal in length and size (subgenus *Nanophyes*) 3

2. Fore femora each armed beneath with two fine spines, middle and hind femora with three spines; elytra testaceous except for black, raised basal margin; without white V-shaped fascia on disc of elytra; ("bred from oval twig swelling on mountain cedar, *Sabina sabinoides*, collected at Austin, Tex. . . .") ..... *sabinae* (Notman)
   Fore femora unarmed, middle and hind femora of female and hind femora only of male each armed with a single, very small spine; elytra with a large triangular black spot at base and a median white V-shaped fascia ..... *vesperus* n. sp.

3. Elytra rather uniformly pale reddish; length, 1.6 mm.; Canada, Alberta and Manitoba ..... *canadensis* Brown
   Elytra with a dark brown to black spot or fascia; length 2.0–2.2 mm. 4

4. Claws connate to middle; dark brown V-shaped fascia on disc of elytra; vestiture of rather coarse, elongate setae; Florida, Ohio ..... *watsoni* (Blatchley)
   Claws connate almost to apex; dark spot at base of elytra; vestiture fine, short; Indiana ..... *obesulus* (Blatchley)

Rhyssomatus fissilis, new species. (Figs. 3, 4)

Holotype male: Length (from anterior margins of eyes to apices of elytra), 5.3 mm.; width (across elytra), 3.0 mm.; width of prothorax, 2.5 mm.; length of prothorax, 1.5 mm.; length of rostrum, 1.8 mm.

Elongate-oval; derm shining, reddish brown except for darker legs and narrow, raised basal margin of elytra; body and femora densely clothed with white and pale yellow, plumose, recumbent scales, these scales being broader and more deeply cleft on the underside.

Rostrum slender, moderately curved, slightly longer than prothorax, widened at apex; feebly sulcate laterally in basal half, smooth dorsally except for ill-defined rows of small punctures; low, median carina from base to point opposite antennal attachments. *Antenna* attached at middle of rostrum; scape not quite reaching eye; funicle 7-segmented, first segment slender, subequal to next four combined, segment 2 slightly longer than 3, segments 3 and 4 equal in length, segments 5, 6 and 7 transverse and becoming progressively broader toward club; club elongate-oval, distinctly segmented, as long as preceding four funicular segments combined, thickly clothed with fine pubescence and scattered suberect setae. *Eyes* coarsely granulate, oval, separated above by a distance equal to the width of the rostrum at point of antennal attachments. *Head* with feeble, transverse swelling above eyes; coarsely punctate, each puncture finely granulate inside and bearing a slender, inconspicuous seta; intervals between punctures shining. *Prothorax* with base a little more than twice as wide as apex; sides strongly converging, slightly arcuate; disc with short, impunctate, median line, coarsely punctate in middle at base, the punctures becoming confluent and forming oblique strigae anteriorly on sides, each puncture bearing an appressed scale, those scales on sides of prothorax broader and more distinctly plumose; ocular lobes prominent. *Scutellum* oval, prominent, thickly clothed with white scales. *Elytra* bisinuate at base; basal margin raised, black; humeri feebly rounded, not prominent; intervals flat except 7, 8, 9 and base of 10 which are subcostate; striae feebly impressed; strial punctures large, deep, each bearing a very slender seta on its anterior margin; parallel sided, plumose, yellow scales rather uniformly dispersed over elytra, but faintly condensed in transverse lines in places. *Ventral side* clothed as above except mesosternum, metasternum and side pieces are more densely covered with broader, deeply cleft, plumose scales. Abdominal sterna shining, remotely punctate except sternum 5 which is closely and coarsely punctate and has a deep, round fovea in middle. Legs stout; femora each with a broad tooth in the inner margin, densely clothed

with plumose scales; tibiae each sharply angulate on outer side near apex, longitudinally sulcate, bearing elongate scales; tarsal claws each with a long, slender tooth on inner side.

Holotype male, Dimmit Co., Texas, VI–21–1933, Tex. Agr. Exp. Sta. light trap (S. E. Jones), and two paratype males with same data except one was collected IV–24–1934. The paratypes closely resemble the holotype.

Rhyssomatus fissilis may be separated from all known species of the genus by the abundant plumose scales and the first six elytral intervals being noncostate. It apparently most closely resembles *Rhyssomatus nigerrimus* Fåhraeus and has been compared with specimens identified as this species in the U. S. National Museum and the British Museum (Natural History). *R. nigerrimus* is known from Mexico, British Honduras, Panama and Guatemala (Champion, 1904). The essential characters for separating these two species are as follows: *Rhyssomatus fissilis* has abundant, broad, plumose scales on the body and legs; the first six elytral intervals are noncostate while intervals 7, 8, 9 and base of 10 are subcostate; and the inner margin of each tibia is feebly sinuate. The body of *Rhyssomatus nigerrimus* is glabrous, or nearly so;all intervals are feebly costate; and the inner margin of each tibia is strongly sinuate.

Rhyssomatus fissilis traces to *R. ovalis* Casey in Casey's (1895) key to species of the genus in America north of Mexico. *R. ovalis* is a much smaller species with convex elytral intervals and is entirely glabrous.

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TWO SPECIES OF BISON CONTEMPORANEOUS IN EARLY RECENT DEPOSITS IN TEXAS

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ABSTRACT. Remains of an extinct bison, presumably *Bison antiquus*, were found at Wichita Falls, Texas, along with bones of small bison, referred to the modern buffalo. The time range of the genus *Bison* in North America is discussed. Other bones found include those of turtle, prairie dog, coyote, antelope, and white-tailed deer. Typical Pleistocene species are not represented, and the deposit is considered to be of early Recent age.

For many years most of the sand and gravel used in commercial construction near Wichita Falls, Texas, has been obtained from Sangamon-age terraces of the Big Wichita River, both east and west of the city. In August, 1958, the Northwest Materials Company of Iowa Park, Texas, made a series of test borings in a lower, Recent, terrace, just west of Wichita Falls, and as a result of these tests opened a commercial quarry. The owners of the company, Mr. John W. Clapp, John W. Clapp, Jr., and L. B. Clapp, and their workmen, especially Mr. Clay Davis, have been most cooperative in saving bones of animals uncovered in their operations in the Sangamon terrace near Iowa Park. They were equally diligent in preserving the numerous bones found in the new quarry in the lower terrace. I wish to express my thanks to these men for their many courtesies.

In the lower terrace the quarrying operations extended through two distinct types of deposits. The superficial materials consisted of a silty, reddish sand, without obvious bedding except for occasional pebble bands that can rarely be followed more than a few feet. The sand appears to be wind-deposited, at least in large part. The reddish sand maintains a rather uniform depth of about seven feet. Bones found in the upper part of the reddish sand are usually fibrous in appearance, etched by humic acid, and give off a strong odor of burned protein and a heavy smoke when heated to incandescence. Deeper in the reddish sand, many bones are well preserved but usually have a reddish stain. When heated to incandescence they too give off a strong odor and heavy smoke. Fractures usually run parallel to the long axis of the bone. Bones of the modern buffalo are most abundant in the reddish sand, but fragments of box turtle, coyote and prairie dog were also

noted. Bones from the reddish sand are only a few hundred to a few thousands of years old.

The lower edge of the reddish sand forms a sharp contact with the grayish-white sand below. This lower sand is strongly bedded, often cross-bedded, and rather coarse, clean, and free from silt. Numerous pebbles up to an inch in diameter are scattered through the white sand. There are many "clay-balls" of reworked, red clay, round to oval and one to six inches in diameter. Fossils found in the white sand are usually white or yellowish white, sometimes blotched with dusky or black. The entire surface of an occasional bone will be blackish or chocolate colored. In at least two cases, such bones were found in place and in contact with clay-balls. Probably the dark stain comes from the clay. All bones from the white sand give off a moderate to slight odor of burned protein when heated to incandescence, but do not smoke. The bones are smooth-surfaced and fractures occur at any angle, not principally parallel to the long axis. The bones are but slightly mineralized, obviously much older than the bones found in the reddish sand, and might best be referred to as subfossil.

As vertebrate remains began to accumulate from the quarry, a striking feature became apparent. Bones of three distinct types of bison were present. In the reddish sand the remains of the buffalo, *Bison bison bison*, were abundant. In the white sand the bones of *Bison* outnumbered those of all other species by more than ten to one, but were either much larger or considerably smaller than those of the buffalo.

The initial excavations were begun approximately 100 yards south of a site where borings had indicated that the deposits were especially deep and gravelly, and proceeded in the direction of the borings, on a front about 50 yards broad. As the excavation approached the gravelly site, interest of both the writer and the workmen increased. As the dragline entered the gravelly deposit, it was apparent that channel fill in the terrace had been reached. The gravelly deposit was coarser and contained quartzite cobbles up to six inches in diameter. Several bones were found in the channel. When heated they gave off a strong odor and heavy smoke. The channel seems to be of an age with the lower part of the reddish sand.

The river at the site of the quarry is almost at the extreme southern edge of its valley, about 200 yards from the Permian hills. The terraces, both Recent and Sangamon, lie to the north of the river. Apparently the river, in swinging its meanders to the south, cut across a meander loop and preserved the early Recent deposits containing the fossils. Presumably the sand deposits now being excavated are the

remnants of deposits laid down when the river began its northward movement, sometime in the early Recent. The test borings showed the white sands to be of limited extent. Opening a quarry a few hundred yards east of the Northwest Materials Company excavations revealed only reddish sand and bones of only the modern buffalo.

The terrace history and lack of mineralization of the bones found in the white sand indicate an age not older than late Wisconsin phase of the Pleistocene, and probably somewhat younger. The fauna found in the excavations includes only one extinct species, a large Bison (cf. *antiquus*). Characteristic late Pleistocene mammals, such as horse, mammoth and camel, were not represented among the hundreds of bones examined. Possible exception are two water-worn fragments of large bones found, but not saved, in the early part of the collecting. They may have been proboscidian, but probably were parts of the humerus or femur of one of the large bisons. The absence of the typical Pleistocene genera suggests post-Pleistocene age. Although the mammoth, horse and camel did linger on into the Recent, they must have been rare after Wisconsin time. There is evidence that the large *Bison* did remain common in the earliest Recent, in association with man, after the horse, elephant and camel had become rare or extinct. The evidence suggests that the present fossils date from the earliest part of the Recent epoch.

A number of the fossils were found by the writer, in place in the deposit. The great bulk of the specimens, however, were found and saved by the workman at the site. The bones were simply piled up in some convenient place to be picked up at intervals. A workman first sees a bone when it is dumped from the dragline bucket or from a truck. There is no opportunity to determine the level at which the bone lay in place. Many of the bones were broken in the quarrying operations. Most of the fossils are but fragments, broken limb bones and fragmentary vertebrae. Little can be done with such material and the total number of important specimens is limited. Nevertheless a small but important fauna is now represented.

Turtle.—No shell fragments were found but a broken limb bone is apparently from a pond turtle. It is almost as large as the bone of a thirteen-pound snapping turtle.

Cynomys ludovicianus.—The left ramus of a prairie dog is identical to the fossils from the white sand in appearance and reaction to heating. Prairie dog remains were found also in the reddish sand. The species, therefore, sooms to have lived in the area continuously during the deposition of the terrace.

Canis latrans.—The distal two-thirds of a coyote tibia was found in place in the white sand.

Antilocapra americana.—The proximal portion of a metopodial of a young antelope was found by a workman. The distal end of a metapodial of an adult antelope did not smoke when heated, and therefore apparently belongs to the fauna of the white sand, although in color the bone is similar to the bones found in the reddish sand.

Odocoileus virginianus.—The white-tailed deer is represented by a well-preserved maxillary fragment containing the three molars, and the distal end of a femur.

Bison cf. *antiquus.*—Although numerous fragments apparently represent this species, the material is all rather unsatisfactory. Identification of *Bison antiquus* versus *Bison occidentalis* must be based on horn cores or skulls. The material here referred to *B. antiquus* includes fragments of horn cores of two different individuals, both possessing a portion of the burr. Both specimens are "slabs," fragments of the core bases, and cannot be reconstructed even to determine basal diameter. Consequently, reference of the material to *antiquus* is provisional. The majority of the large *Bison* remains found in association with ancient man in the southwest have been referred to this species or the synonymous *B. taylori* (see Skinner and Kaisen, 1947).

Other material definitely representing a big bison includes the proximal end of a radius, the distal end of a tibia and a calcaneum, all much larger than the same bones of *Bison bison*, and a hoof-bone and a naviculo-cuboid, slightly but definitely larger than those of the largest buffalo available. The fragments of radius and tibia were examined by Dr. Claude Hibbard of the University of Michigan Museum of Paleontology and identified as belonging to "one of the larger *Bison*."

Bison bison subsp.—The most common bones in the white sand belong to a small form of Bison. Material includes the horn core of an old bull; horn core of a young bull; frontal area and one horn core of a presumed female; metacarpal; distal end of another metacarpal; tibia missing proximal end; distal end of another tibia; numerous other skeletal elements.

The presence of a small bison in north-central Texas was noted by the writer (1959), when a partial skull with both horn cores was reported from a site a few miles from the present quarry, and a tiny bison jaw from Beaver Creek, Wilbarger County, was figured. The age of these specimens was judged to be latest Wisconsin or earliest Recent. The jaw from Beaver Creek was found in association with a jaw that might well have been that of *Bison antiquus* or *B. occidentalis.*

Mr. Bob Slaughter of Dallas, Texas, has kindly loaned me the metacarpal of a tiny *Bison* that he found in a channel fill in a terrace of the Trinity River, near Dallas. The metacarpal is heavily mineralized.

The bone is slightly longer than the complete metacarpal from the white sand, but otherwise closely resembles the latter. Archeologists have dated the channel fill, on the basis of artifacts found there, at about 10,000 years of age.

All of this material suggests that the small *Bison* represents an undescribed form. However, the specimens available differ from those of *Bison bison* only in uniformly small size. The three presumed males represented by horn cores have uniformly short, straight, "stubby" cores. The horn core of the supposed female is greatly curved, rounded on the upper side but flattened below. The core is small and almost goat-like in appearance and in almost every other respect differs from the other three horn cores.

One metacarpal from the quarry is somewhat better mineralized than the other bones, and when heated it gave off only a slight odor. Almost certainly it is of an age with the other material from the white sand. It is definitely larger and more massive than the other two available metacarpals, and is as large as small metacarpals of *Bison bison bison*.

Two partial skulls, the female from the Northwest Materials Company quarry and the old bull reported in 1959, show the angle of emergence of the horn cores. In both the cores are directed posterior to the transverse plane of the skull, as are the horn cores of *Bison bison*.

The available material of the small bison that lived in north-central Texas during the early Recent shows too much individual variation to warrant description as a new species. It seems likely that the small bison is at least subspecifically distinct from the buffalo, but even this is uncertain. Fortunately the fauna of this age is being intensively studied in connection with the occurrence of ancient man in the southwest, and it may be assumed that the true relationships of the small bison will eventually be established. Pending proof, the form is best referred to *Bison bison*.

The history of the genus *Bison* in North America is slowly being worked out. Not many years ago it was thought that the giant bisons, such as *Bison latifrons*, *B. chaneyi*, and *B. alleni*, were elements of the earlier part of the Pleistocene epoch. Hibbard (1955-b) has shown that, on the contrary, the giant bisons were unknown in North America before the Illinoian age and that all dated occurrences seem to be of the later, Sangamon age. The giant bisons apparently became extinct at the end of the Sangamon, to be replaced by the smaller forms, *Bison occidentalis* and *B. antiquus*, of the Wisconsin age. The latter species, in turn, died out at the end of the Wisconsin age, and were

replaced by the modern buffalo, *Bison bison*. The three size groups seem to be well separated in time; giant forms in the Sangamon, medium-sized species in the Wisconsin, and the relatively small buffalo in the Recent.

The actual time range of *Bison antiquus* is rather exactly known. Hibbard (1955-a) found this species to be a contemporary of *Bison chaneyi*, a giant bison, in Mexican deposits of late Sangamon age. There are numerous records of *Bison antiquus* in the Wisconsin age. The present record, if the large bison specimens actually represent *B. antiquus* and not *B. occidentalis*, shows the species to have been a contemporary of the buffalo in the very early Recent. The time span of *Bison antiquus*, then, is the Wisconsin age, from the late Sangamon to early Recent.

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DISTRIBUTION OF THE SUBSPECIES OF *SCELOPORUS UNDULATUS* (REPTILIA: IGUANIDAE) IN OKLAHOMA

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ABSTRACT. Examination of 1366 specimens of *Sceloporus undulatus* from Oklahoma revealed the presence of four subspecies in the state. *Sceloporus undulatus erythrocheilus* is restricted to the Black Mesa area of Cimarron County, *S. u. garmani* ranges over the prairie areas of Oklahoma, *S. u. consobrinus* is restricted to the southwestern corner of the state and *S. u. hyacinthinus* occurs in the eastern forested regions of Oklahoma. Intergradation between *S. u. garmani* and *S. u. hyacinthinus* occurs in a broad zone at the prairie-forest ecotone and *S. u. garmani* and *S. u. consobrinus* intergrade in southwest Oklahoma. No evidence of intergradation between *S. u. garmani* and *S. u. erythrocheilus* was found. The type locality of *S. u. consobrinus* as restricted to an area in Beckham County, Oklahoma, is too far northwest and lies in an area inhabited by *S. u. garmani*.

Since the description of *Sceloporus consobrinus* by Baird and Girard in 1852, many records of the occurrence of *Sceloporus undulatus* (Latreille) in Oklahoma have appeared in the zoological literature. Unfortunately, these records are generally of little use in defining the ranges of the subspecies which occur in Oklahoma, mainly due to the revolution in nomenclature in this group since 1938. Few studies have treated the distribution of the subspecies of *Sceloporus undulatus* over the entire state, and those which have were handicapped by a lack of material. In Smith's (1938) monograph of *Sceloporus undulatus* he analyzed specimens from only 21 localities in Oklahoma. There are several hundred localities represented in the collections on which this study is based.

In this study the geographic distribution of the subspecies of *Sceloporus undulatus* in Oklahoma has been analyzed. The careful and complete delineation of such ranges and integradation zones is prerequisite to any definitive study of the zoogeography of an area (Smith, 1956), and such syntheses not only interest zoogeographers, but form part of the conspectus of the animal kingdom which is the basis for all of the zoological sciences, (Schmidt, 1953).

The assistance of many persons who have made specimens available for this project is gratfully acknowledged. The following persons

[1] Based on a thesis submitted to the graduate faculty of Oklahoma State University in partial fulfillment of the requirements for the degree of Master of Science.

have permitted examination of specimens under their care: W. Frank Blair, University of Texas Natural History Collection; Bryce C. Brown, Strecker Museum, Baylor University; Charles C. Carpenter, University of Oklahoma; Doris M. Cochran, United States National Museum; Howard K. Gloyd, Chicago Academy of Sciences; Norman E. Hartweg, University of Michigan Museum of Zoology; John M. Legler, University of Kansas Museum of Zoology; Hobart M. Smith, University of Illinois Museum of Natural History; Ernest E. Williams, Museum of Comparative Zoology. Specimens were also obtained from the Museum of Zoology of Oklahoma State University.

In addition to these individuals and institutions, special thanks are extended to Mr. John Steele of the Oklahoma Department of Wildlife Conservation and Mr. Ralph J. Ellis of the Oklahoma Cooperative Wildlife Research Unit for collecting specimens used in this study; to Dr. Charles C. Carpenter for advice and assistance; to Dr. Bryan P. Glass of Oklahoma State University who directed the study and to Dr. T. Paul Maslin who assisted in the preparation of the manuscript.

METHODS

In the course of this study a total of 1366 specimens was examined. Complete collection data for each specimen was copied from museum catalogs or was supplied by persons who loaned specimens. In analyzing this material, 946 specimens were carefully examined and details of squamation, color pattern, sex and size recorded. The remainder (420), were examined for general color pattern and size variation. Counts of the dorsal scales, femoral pores and scales between femoral pore rows were made by the methods outlined by Smith (1939). The sex of each specimen was determined by examination of the post-anal scales and verified by noting the ventral color pattern. The snout-vent length of each specimen was recorded as was the extent and position of ventral color patches and the presence or absence of dorsal bands and stripes.

The numerical data were analyzed by means of the graphic analysis method of Hubbs and Hubbs (1953), which provided an index to the areas of intergradation. Analyses of the dorsal scale counts and femoral pore counts are presented in figures 1 and 2. The geographic locations of the groups are as follows: 1. eastern Oklahoma north of the Arkansas River; 2. south of the Arkansas River and east of Pittsburg County; 3. Osage County; 4. Tulsa County; 5. Okmulgee County; 6. Coal, Johnston and Atoka Counties and south to the Red River; 7. Creek County and eastern Payne County; 8. Seminole and Pontotoc Counties; 9. Payne County west to Kingfisher County and north to the state

line; 10. Pottawatomie County; 11. Cleveland, McClain, Garvin, Grady, Canadian, Caddo and Custer Counties; 12. Murray, Carter and Love Counties; 13. Alfalfa County west to Texas County and south to the Canadian River; 14. Canadian River south to Beckham County; 15. Harmon, Jackson and Greer Counties; 16. Comanche County; 17. Cimarron County.

DISTRIBUTION OF SUBSPECIES

SCELOPORUS UNDULATUS ERYTHROCHEILUS MASLIN

This is the most distinctive and easily recognized race of *Sceloporus undulatus* occurring in Oklahoma. Males and females alike were found to have a mean number of dorsal scales greater than 44, all other Oklahoma forms averaging fewer. The femoral pore counts were also reliably divergent but counts of the scales between the femoral pore rows indicated some overlap with *S. u. hyacinthinus* in this character. These details of scutellation provided considerable evidence of the distinct nature of this form in Oklahoma and other data support the evidence. The author's observations revealed that the breeding males of the Oklahoma populations have red lips which is a unique characteristic of this subspecies. The maximum snout-vent length attained by *S. u. erythrocheilus* is much greater than that of any other subspecies occurring in Oklahoma. The mean snout-vent length of *S. u. erythrocheilus* (61.8 mm. in males, 62.8 mm. in females) is substantially greater than that of the next largest Oklahoma subspecies, *S. u. hyacinthinus* (52.6 mm. in males, 54.5 mm. in females).

The great morphological divergence between *S. u. erythrocheilus* and *S. u. garmani* has raised the question of whether these forms actually would intergrade should their ranges meet. Maslin (1956) has suggested that they do not, but they probably occur sympatrically, behaving as species. Maslin continues by writing that intergradation may occur in the Oklahoma panhandle. Observations made during this study indicate that there is no intergradation between these forms in Oklahoma. No evidence of sympatry was found, and the habitat preferences of the two forms make intergradation unlikely. *Sceloporus undulatus erythrocheilus* lives on the massive sandstone cliffs of the canyon country near the Black Mesa. *Sceloporus undulatus garmani* is a ground-dwelling form of the lowlands and its climbing is restricted to sorties up trees. The westernmost Oklahoma record of *S. u. garmani* is four miles east and seven miles south of Guymon, Texas County and the easternmost record of *S. u. erythrocheilus* is one mile west of the Dinosaur Quarry in Cimarron County, a separation of 83 miles. If

the ranges of these forms are found to overlap in Oklahoma, it is probable that ecological and ethological barriers would allow each to retain its identity in the area of sympatry.

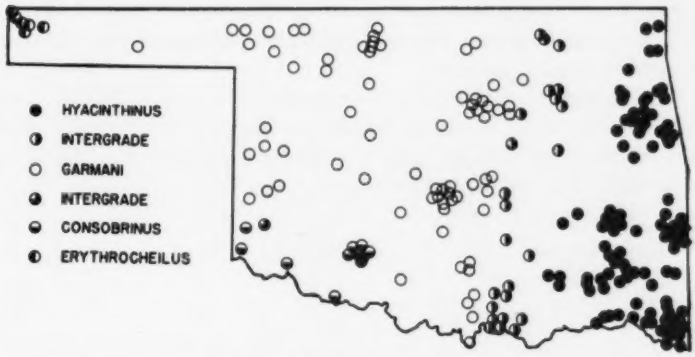
The range of *Sceloporus undulatus erythrocheilus* in Oklahoma is exactly co-extensive with the Oklahoma portion of the Navahonian Biotic Province (Dice, 1943) or the Mesa de Maya Biotic District as outlined by Blair and Hubbell (1938).

SCELOPORUS UNDULATUS GARMANI (BOULENGER)

This form presents many problems in the delineation of ranges and intergradation zones of *Sceloporus undulatus* in Oklahoma. *Sceloporus undulatus garmani* occupies the unique position of a link, contacting and intergrading with two other subspecies in Oklahoma and possibly contacting a third. The range of *S. u. garmani* extends east from the panhandle to the eastern edge of the prairie, south to its contact with *S. u. consobrinus* and across the Red River in south-central Oklahoma. In the east, *S. u. garmani* intergrades with *S. u. hyacinthinus* in a broad zone which approximately coincides with the eastern edge of the prairie-forest ecotone. Intermediate series have been examined from Bryan, Coal, Creek, Johnston, Marshall, Okmulgee, Osage, Pontotoc, Seminole, Tulsa and Washington counties. The scale count data are intermediate for most of these groups, (figs. 1 and 2) but analysis of color pattern was the most reliable method of determining the status of intergrade series. The dorsal color patterns of *S. u. garmani* is striped in white and gray, while *S. u. hyacinthinus* has black crossbars on a brown ground color. The gular region of *S. u. garmani* is rarely invaded by melanophores, while the males and many of the females of *S. u. hyacinthinus* bear extensive dark gular markings. The ventrolateral blue patches of *S. u. garmani* never meet on the mid-ventral line and are not black edged. The ventrolateral patches of *S. u. hyacinthinus* are black edged and are often confluent mid-ventrally. Intermediates between these contrasting color patterns were easily detected and interpreted as evidence of intergradation.

Smith (1956) has shown that the ranges of these two forms do not meet in Kansas and his range map indicates a gap from 95°25′ to 97° at the Kansas-Oklahoma border (37th parallel). Collections available for this study reveal that if this gap exists in Oklahoma then it must be far less extensive than has been indicated, (Conant 1958).

In the southwestern corner of the state, *Sceloporus undulatus garmani* intergrades with *Sceloporus undulatus consobrinus*. The zone of intergradation is difficult to ascertain with precision due to a lack of specimens from critical areas. Peripheral records of typical *S. u.*



Map 1. Geographic distribution of the subspecies of *Sceloporus undulatus* in Oklahoma.

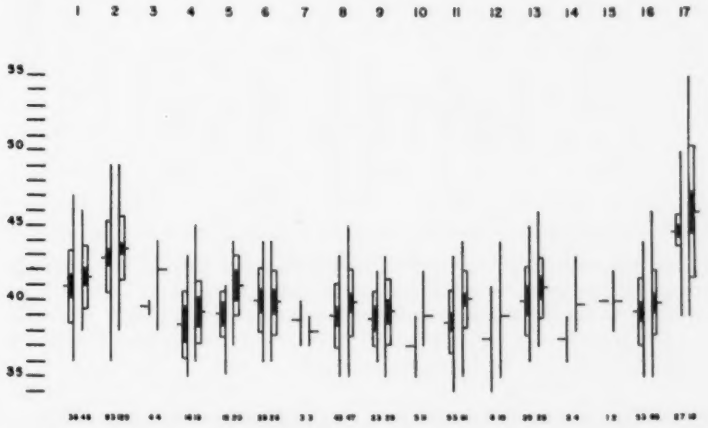


Fig. 1. Comparison of the dorsal scale counts of *Sceloporus undulatus* from Oklahoma. Each bar diagram shows the range, mean, 1 standard deviation and 2 standrd errors. Values of N for males (left) and females (right) are: 1. 36, 46; 2. 93, 120; 3. 4, 4; 4. 16, 18; 5. 12, 20; 6. 28, 26; 7. 3, 3; 8. 43, 47; 9. 23, 28; 10. 5, 11; 11. 55, 61; 12. 6, 10; 13. 20, 28; 14. 2, 4; 15. 1, 2; 16. 53, 65; 17. 27. 18.

garmani are from Sayre, Elk City and Mayfield in Beckham County, six miles east of Comanche in Stephens County and Kiwanis Canyon in Caddo County. A pair of specimens from two miles west of Reed, Greer County, are considered representative of an intergrade population. The male specimen has black-edged ventral color patches which are typical of *S. u. consobrinus* but the gular area is only faintly suffused with dark color as in *S. u. garmani*. The scale counts of both specimens are intermediate.

Contrary to several recent reports the ranges of *S. u. consobrinus* and *S. u. hyacinthinus* are not in contact in Oklahoma; they are separated by *S. u. garmani*.

The maximum size previously recorded for this form (54 mm.) was surpassed by some of the specimens examined. Many of the adult females exceeded this size and a length of 60 mm. was attained occasionally. The largest specimen seen was a 62 mm. female collected near Mooreland, Woodward County by Mr. Ralph J. Ellis.

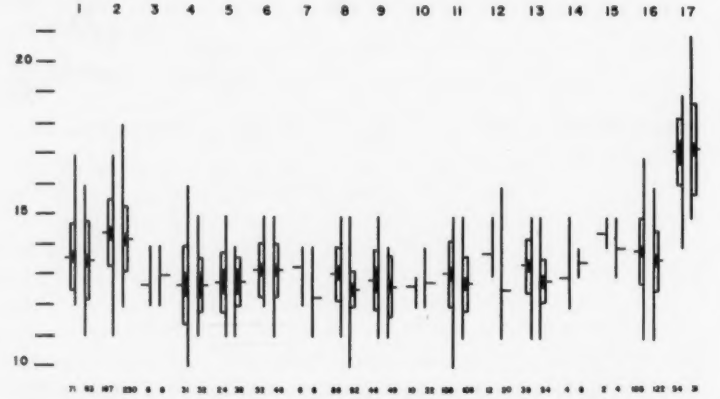


Fig. 2. Comparison of the femoral pore counts of *Sceloporus undulatus* from Oklahoma. Each bar diagram shows the range, mean, 1 standard deviation and 2 standard errors. Values of N for males (left) and females (right) are: 1. 71, 83; 2. 187, 230; 3. 6, 8; 4. 31, 32; 5. 24, 38; 6. 52, 46; 7. 6, 6; 8. 86, 92; 9. 46, 49; 10. 10, 22; 11. 108, 106; 12. 12, 20; 13. 38, 54; 14. 4, 8; 15. 2, 4; 16. 105, 122; 17. 54, 31.

SCELOPORUS UNDULATUS CONSOBRINUS (BAIRD AND GIRARD)

Sceloporus undulatus consobrinus has a restricted range in Oklahoma. The population of the Wichita Mountains in Comanche County represents the northeasternmost extremity of the subspecies' range. From that area, the range extends west and south into Texas. This pattern of distribution is similar to that of several other western plant and animal species confined to that region of Oklahoma. This peculiar fauna has been recognized by Dice (op. cit.) as an extension of the Comanchian Biotic Province and (in part) by Blair and Hubbel (op. cit) as the Mesquite Plains Biotic District.

Uncertainty concerning the provenance of the types of *Sceloporus consobrinus* caused Smith (1938) to restrict the type locality to an area along one of the forks of the Red River in Beckham County.

Information obtained in this study indicates that this restricted type locality is too far northwest, and lies in an area inhabited by *S. u. garmani.*

SCELOPORUS UNDULATUS HYACINTHINUS (GREEN)

The range of *Sceloporus undulatus hyacinthinus* in Oklahoma is easily delimited. From a broad zone of intergradation with *S. u. garmani* at the eastern edge of the prairie-forest ecotone, this form extends over the forested areas of the state. Comparison of the specimens of *S. u. hyacinthinus* from north of the Arkansas River Valley with those from south of the Valley revealed slight variation in dorsal scale and femoral pore counts. This difference is probably the result of sampling the ends of a cline, but the large size of the groups obscures the exact geographic relationships of the variation. There is a possibility that this cline extends to the junction of the ranges of *S. u. hyacinthinus* and *S. u. undulatus.* This latter form reaches a length of 77 mm. and it may be significant that the largest specimen of *S. u. hyacinthinus* measured was a 72 mm. female from McCurtain County, in the south-eastern corner of Oklahoma.

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THE SOUTHWESTERN NATURALIST 6 (2): 86–91 SEPTEMBER 1, 1961

NEW SPECIES OF SOUTHWESTERN ACALYPTRATE DIPTERA

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ABSTRACT. Four new species of acalyptrate flies are described, as follows: Family Ephydridae—*Scatophila iowana* from Iowa; *Notiphila (Agrolimna) hamifera* from Arizona and Colorado; Family Chyromyiidae—*Aphaniosoma frontata* from California, Arizona, Utah and Baja California (Mexico); *Aphaniosoma aldrichi* from Texas.

The holotype and allotype specimens of the new species described below are being placed in the U.S. National Museum collection. The disposition of the paratypes is indicated separately for each species.

SCATOPHILA BECKER (EPHYDRIDAE)

The most recent summary of the genus is that of Sturtevant and Wheeler (1954) in which 21 Nearctic species were discussed. In their key the new species described here runs to couplet 8 and dubiously to *ordinaria;* it is readily separated from the latter by the wholly dark legs, the more distinct mesonotal pattern, and the different arrangement of the orbital bristles.

SCATOPHILA IOWANA, NEW SPECIES

Antennae, palpi and proboscis dark; frons dull, dark grayish to black, the orbits scarcely differentiated. Anterior orbital thin and short, the posterior one large and strong, the distance between them equalling that between the latter and the inner vertical, and twice that between the inner and outer verticals. Face of male and female about alike, grayish pollinose with a brownish tinge, the median carinal hump only moderately strong and bearing 1–2 pairs of bristles plus a few scattered hairs. Oral margin with 4–6 down-curved bristles, usually more on females than on males.

Acrostichal hairs of normal size, in two rather straight rows of about 7 in each row; no enlarged presutural acrostichals or dorsocentrals. Mesonotum dull pollinose brown and gray, sometimes with a faint olive cast, the pattern diffuse but generally obvious. Scutellum mostly dark, paler along midline. Legs all black, including tarsi. Wings

dusky, the white areas reduced and without clearly defined margins. Abdomen pollinose, only slightly shining when viewed from certain angles. Body length 2.0 to 2.2 mm.

Distribution and *types*. HOLOTYPE ♂, ALLOTYPE and 45 PARATYPES bearing labels as follows: 3 mis. w. Boone, Boone Co., IOWA; 42° 5.0′N 93° 55.8′W; VII–4–1960; D. L. Deonier; at seep. One PARATYPE labelled: Lake Odessa, Louisa Co., Iowa; 41° 12.1′N 91° 5.5′W; VIII–9–1960; D. L. Deonier; at seep. Paratypes are being distributed among the following: U. S. National Museum, Academy of Natural Sciences (Philadelphia), Iowa State University collection, and the private collections of Mr. Deonier and of the writer.

Notes. Mr. Deonier reported (private correspondence) that he had collected 1,270 specimens of this species at a seep near Boone, Iowa. They were taken from a rather small area (about 100 square feet) near the seep, the latter having a definite saline appearance with salt-like encrustations on the rocks and sparse vegetation.

NOTIPHILA FALLÉN (EPHYDRIDAE)

The Nearctic species of *Notiphila* were most recently summarized by Cresson (1946). The new species described below runs to *pallidipalpis*, couplet 5, in his key; in specimens which I identify as *pallidipalpis*, from Minnesota, the tibiae are all dark, the dark bands of the tergites extend all or nearly all the way to the lateral margins, and the male tibiae are quite normal. In the new species, *hamifera*, the front tibiae and tarsi are darkened, the second tibia is mostly pale, the hind tibia is dark in the middle, the dark abdominal bands cease at the angles of the tergites, and the male hind tibia is apically modified (Fig. 1).

Notiphila (Agrolimna) hamifera, new species

Face golden; facial hairs fine, the series extending nearly to the antennae; palpi tan; cheeks broad, nearly equal to half the eye height. Antennae dark, third segment a little pale at base; arista with about 12 dorsal branches. Frons dull brownish on orbits and on the large central triangle, dull blackish between these; central triangle usually with a narrow, median, poorly-defined blackish stripe.

Mesonotum dull brownish with a slight olivaceous cast, and with a trace of faint longitudinal brown stripes in and between the dorsocentral rows. Scutellum colored as mesonotum, not darker on sides. Abdomen with dark brownish bands and lighter grayish to yellowish-gray pollinose areas; a pale median longitudinal stripe, the basal dark

bands elongated posteriorly along the median pale stripe and narrowed laterally to become extinct at about the angle of the tergite, thus leaving the extreme lateral areas (ventral lobes of Cresson) all pale.

Pleura grayish pollinose, more brownish above. All femora dark; fore tibiae dark except at the knees, the fore tarsi rather dark. Third tibia dark in middle, broadly pale at each end; middle tibia only slightly darkened in middle, bearing a stout preapical extensor bristle. Tarsi of second and third legs pale. Apex of hind tibia of male modified, bearing a stout hooklike bristle (Fig. 1); some bristles of hind

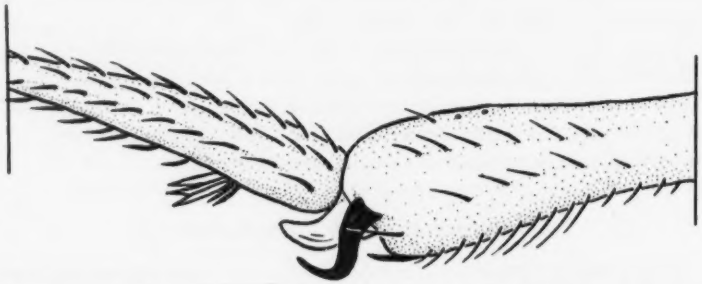

Fig. 1. *Notiphila hamifera*, n. sp., apical portion of hind tibia of male and adjacent tarsal segment.

tarsal fascicle thickened. Female tibiae normal. Wings normal for the genus. Body length about 4.5 mm.

Distribution and *types*. HOLOTYPE ♂, ALLOTYPE, and two male PARATYPES, Oak Creek Canyon, ARIZONA, June 21, 1951; one PARATYPE male, Deckers, COLORADO, August 25, 1950. All specimens were collected by the writer. The paratypes are in the author's collection.

APHANIOSOMA BECKER (CHYROMYIIDAE)

There is but a single described species from North America, *quadrivittatum* Malloch (1915) from Illinois. Melander (1913) reported an unidentified specimen from the Bahamas, and stated (personal communication) that he had a specimen of *quadrivittatum* from Lafayette, Indiana, determined by Aldrich. Collin (1949) has summarized the Palaearctic species.

The genus is not large, with less than 25 described species in the world. It is a difficult group taxonomically, due in large part to the exceedingly small size of most of the species, some of which are less than 1 mm. long. Specimens are taken most often by sweeping around

tall grass clumps and sedges associated with sea coasts and other strongly saline or alkaline areas. The genus can be separated from the two other genera of the family as follows:

1. Orbitals small, reclinate; upper occiput concave; postverticals minute or absent; propleural bristle present, small ....*Aphaniosoma* Becker
   Orbitals strong, the anterior pair convergent, the two posterior pairs reclinate; upper occiput rounded to convex; postverticals small but distinct; propleural absent 2

2. Scutellum with 4–6 short marginal bristles in addition to the four large scutellars; scutellar disc with small scattered hairs .....*Chyromya* Desvoidy
   With only the four usual scutellars, the scutellum otherwise entirely bare.....*Gymnochiromyia* Hendel

KEY TO THE NEARCTIC SPECIES OF APHANIOSOMA

1. Acrostichal hairs in about 6 poorly defined rows; apical scutellars closer to each other than to the basals....*aldrichi*, n. sp.
   Acrostichals 2-rowed anteriorly, 2- or 4-rowed posteriorly; marginal scutellars nearly equidistant from one another.... 2

2. Acrostichals clearly 2-rowed; a pair of enlarged frontal bristles anterior to ocelli; scutellum and posterior mesonotum yellow, anteriorly with about 6 broad stripes, often rather confluent; pleura with several dark markings; length up to 1.75 mm.....*frontata*, n. sp.
   Acrostichals irregularly 4-rowed posteriorly; no enlarged frontal bristles; mesonotum with 4 broad stripes anteriorly, often somewhat confluent; pleura pale except on lower sternopleura; length 2.0 mm.....*quadrivittatum* Malloch

APHANIOSOMA FRONTATA, NEW SPECIES

With about three reclinate orbitals on each side, equal to ocellars in length. A well developed pair of bristles on midfrontal area anterior to ocelli, equalling verticals in size. Arista micropubescent, nearly four times length of 3rd antennal segment. Face concave centrally, the vibrissal angle somewhat projecting; two rather strong orals at vibrissal angle, remainder of cheek heavily clothed with fine pale hairs.

Cheeks narrow below eyes, greatly broadened behind. Head pale yellow, the ocellar area and concave occipital area blackened.

One pair of dorsocentrals and a row of pale hairs in each dorsocentral row; acrostichals in 2 rows, ceasing at the posterior third of mesonotum. Meso- and sternopleura with small pale hairs in addition to the usual bristles. Mesonotum yellow and gray, heavily overlaid with dense pollinosity. Mesonotum primarily yellow with 6 broad grayish-black stripes: 2 in acrostichal rows, oneo utside each dorsocentral row, and another more laterally on each side; the stripes are largely fused on the darkest specimens. Remainder of mesonotum and scutellum pale yellow; humeri and notopleura yellow, pleura otherwise darker yellow with irregular grayish-black marks. Halteres pale; legs pale, the apical tarsal joints sometimes darker.

Abdomen grayish-black with pale yellow bands along apical margins of tergites. Wings unmarked; 2L and 3L converging slightly at tip, the distance between their tips about half that between apices of 3L and 4L. Penultimate section of 4L about 1.3 times the length of the posterior crossvein. Length about 1.2 mm., sometimes larger.

Distribution and *types*. Sixty specimens have been collected, from the following localities: CALIFORNIA: Indio, Trona, Lone Pine, Panamint Springs, Little Lake, Norco, Jacumba Springs; ARIZONA: Tempe; UTAH: Saltair; MEXICO: San Telmo in Baja California. HOLOTYPE ♂, ALLOTYPE and 19 PARATYPES, Indio, California, July 16, 1951, collected by the writer; 12 PARATYPES, Panamint Springs, California, April 29, 1950, D. Lindsley, collector. Paratypes are being placed in the collections of the U. S. National Museum, The University of Hawaii, and the private collections of A. H. Sturtevant and of the writer.

APHANIOSOMA ALDRICHI, NEW SPECIES

Frons yellow, the bristles pale and small, the orbits with a row of short reclinate hairs, the front with scattered pale hairs. Face, antennae and cheeks yellow; arista slightly more than twice length of 3rd antennal segment, very finely pubescent. Cheeks very broad, covered with short pale hairs.

Mesonotum yellowish, or tannish-yellow, or with an olivaceous hue, and with a tendency to show four darker stripes: a pair on the anterior third of the mesonotum in the acrostichal region, and a longer, usually darker pair, just outside the dorsocentral rows. One pair of dorsocentrals; acrostichals in about 8 irregular rows, pale, reaching scutellum. No prescutellars. Basal scutellars near suture, apicals close together. Pleura, halteres and legs uniformly pale yellow; mesopleura

with about two very pale bristles on posterior margin and a few scattered hairs; sternopleura apparently bare.

Wings hyaline, green and blue iridescent; costa short spinose; 2L and 3L parallel at tip, the distance between them about 0.7 as great as that between 3L and 4L at their apices. Penultimate section of 4L about twice as long as posterior crossvein. Abdominal tergites with broad grayish bands, the apical margins yellow, with numerous short pale yellow hairs. Body length 1.5 to 2.0 mm.

Distribution and *types*. Forty-nine specimens; TEXAS: Galveston, Port Isabel, Riviera, Freeport, Salt Creek. HOLOTYPE ♂, ALLOTYPE and 21 PARATYPES, Galveston, Texas, Sept, 13, 1953, collected by the writer. Paratypes are in the U. S. National Museum and in the private collections of A. H. Sturtevant and the writer.

The species is named in honor of the famous dipterist, J. M. Aldrich, who collected a specimen of this species at Galveston in June, 1917; the specimen is now in A. H. Sturtevant's collection. The species is readily collected by sweeping clumps of the common salt marsh grass (*Spartina* species) along the Texas coast.

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SPOTTED BAT AND BIG FREE-TAILED BAT IN NORTHERN NEW MEXICO

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ABSTRACT. Mortality in big free-tailed bats, *Tadarida molossa*, led to investigations which resulted in collecting 61 of these bats, 2 spotted bats, *Euderma maculatum*, and other species. Bats were captured in mist nets over water. *T. molossa* flew at air temperatures as low as 55° F; young were generally captured earlier in the evening than adults. Individuals of this species flew at an elevation of 25 feet, singly or in groups of two or three. They flew in light rain and in less inclement weather and appeared to be attracted by captives of the same species. *Euderma maculatum* were captured when air temperatures were 58° and 64°. The rectal temperature of a resting spotted bat approximated its environmental temperatures, and the bat became torpid at lower temperatures. Captive bats of both species died after they developed lung lesions and other pathological conditions not seen in the field. Although rabies is known in *T. molossa* and may have been present, the infection was not confirmed in these specimens.

The spotted bat, *Euderma maculatum* (J. A. Allen), was formerly known from New Mexico by a single adult male found dead during September, 1903, in the Biological Laboratory of the New Mexico College of Agriculture and Mechanic Arts (Miller, 1903), now known as New Mexico State University, University Park, Dona Ana Co., New Mexico. An immature female big free-tailed bat, *Tadarida molossa* (Pallas), captured October 10, 1956, at Carlsbad Cavern, New Mexico, was reported earlier (Constantine, 1958). The present report concerns collections of two *Euderma* and sixty-one *T. molossa* at a locality in northern New Mexico.

In August, 1958, the writer received a report from the New Mexico Department of Public Health indicating that rabies had been diagnosed in bats found moribund at Ghost Ranch, 12 miles NW Abiquiu, Rio Arriba Co., New Mexico. In that month and the next the problem was investigated as time permitted. Field studies and collections were followed by laboratory observations and attempts to adapt bats to captivity for experiments and other purposes. Experiences are as follows.

Field Studies. The Ghost Ranch is in the piñon pine-juniper belt, on the boundary between watered canyons and dry open range. The main buildings of the ranch are situated at the entrance of Arroyo del Yeso, the walls of which in this area are composed of one hundred foot cliffs of Entrada sandstone. The elevation at the canyon entrance is

6,500 feet. Immediate water surface was represented by two swimming pools, a wading pool, a small marshy pond, a large earthen stock tank about sixty by one hundred feet in size, and a stream.

Beginning August 9 and terminating August 19, eighteen moribund or dead bats were found on the ranch. Seven males and seven females were recovered and proved to be immature *T. molassa*. Between August 14 and September 17, forty-seven *T. molassa* were mist-netted. Thirty were adult females, all but three of which were lactating, four were immature males, and thirteen were immature females. Two E. *maculatum* and other species were also taken at this locality. Details are given below.

Arriving at Ghost Ranch August 13, the writer was given a retrospective account of the problem by paleontologist John Ostrom. Ostrom had in his possession a live immature male *T. molossa*, clinically normal except for weakness. A number of other immature specimens, previously found dead or moribund, were retrieved from shallow graves and other sources. That evening two mist nets were set up at the larger swimming pool and the wading pool. Rain, which had fallen heavily in the late afternoon, continued intermittently until 11:15 P.M., when activities were terminated. Many bats, judged to be *Myotis*, avoided the nets. A *Myotis evotis* and one *Plecotus townsendi* were captured.

The following evening, August 14, a mist net was erected at one end of the stock tank and another along its side; the tank width was too great to properly accommodate the netting equipment at hand. A bat, possibly a *Myotis*, was seen at dusk. A flying bat, apparently a *T. molossa*, appeared at 8:30. As many as three similar bats were seen at any one time in what seemed to be intermittent visits to the tank until 12:15 A.M., when field activities were terminated. These bats made barely audible intermittent whistling sounds in flight, vaguely suggestive of sounds made by flying mourning doves. They could not be heard squeaking while in flight. They flew over the sides and ends of the tank at an elevation of about 25 feet, generally dropping to about six feet at the center of the tank. When a captive immature *T. molossa* was induced to squeak, the immediate area was "buzzed" by the flying bats, although they flew too high to be captured by a mist net. After about an hour of interrupted squeaking sessions, an adult female *T. molossa* flew directly at the young bat and was captured in the net. At 9:00 P.M. a dry immature female *T. molossa* was found on the bank of the tank, lying ventral side down. It did not squeak, struggle, or attempt to bite when picked up.

The Ghost Ranch was again visited August 19. Ostrum explained

that four bats, including an immature *T. molossa* at hand, had been found on the ground. Ostrum and Binx Little set up two mist nets at the large swimming pool and by 10:00 P.M., when they terminated their vigil, they had captured three immature *T. molossa* and one *Myotis subulatus*. Meanwhile, the writer and Elliott J. Wescott, Jr. had installed three double-length mist nets at three points across the earthen stock tank, perpendicular to its long axis. A life raft had been obtained to recover captured bats. The watch began at 7:00 P.M. and lasted until sunrise. Light sprinkles fell sporadically throughout the night, following a heavy shower that afternoon. Temperatures ranged between 60 and 70 degrees Fahrenheit during the night. Occasional winds were present in the early evening, but the air was nearly motionless after 9:00 P.M. At 8:20 P.M. the first *T. molossa* was captured. During the forty-five minutes that followed nearly all the immature *T. molossa* taken that night were captured. Practically all adults were taken from then until dawn. The bats were usually captured singly, although three were taken at 4:00 A.M., and event repeated shortly thereafter. Bats were captured during very light rain, but not during somewhat heavier showers. The last *T. molossa* were seen flying together at 4:45 A.M., when one of two was captured, the other seeming to dodge over the net. The following *T. molossa* were netted that night: twenty-five lactating and three nonlactating adult females, eight immature females, and four immature males. About two-thirds of these bats were captured at one end of the center net, adjacent to the bat holding cage, which contained squeaking captured bats, suggesting attraction of the flying bats by the caged bats.

Other bats captured that night included an adult male *Lasionycteris noctivagans* (Le Conte) with descended testes, netted at 2:30 A.M. An adult male *Euderma maculatum* was netted at 3:00 A.M., during a lull between light showers, when the temperature was 64 degrees Fahrenheit and the relative humidity was 78 per cent. The gonad position could not be determined. At 3:45 A.M. an adult male *Lasiurus cinereus* was captured; again, the gonad position was obscured by hair. At 5:00 A.M. a non-lactating adult female *Myotis subulatus* was captured.

The writer returned to Ghost Ranch September 17, accompanied by Floyd W. Worrell. It was learned that no bats had been found on the ground since the last trip. Three double-length mist nets were again suspended over the earthen stock tank and attended all night. The weather that day had been clear and warm. The sky remained clear throughout the night. A nearly constant moderate wind was present until 1:00 A.M., when it subsided for about an hour, then returned sporadically until dawn. At 7:00 P.M. an immature female *T. molossa*

was captured and another at 7:35 P.M. Three more immature females were taken singly between the latter time and 10:30 P.M., when a lactating adult female *T. molossa* was taken. This species was heard on the wing until midnight, but no more were captured.

At 8:38 P.M. an adult male *Euderma* was captured. Its abdomen was distended. The position of the testes could not be determined. At that time the temperature was 58° F., the relative humidity 42 per cent. At 11:00 P.M. an adult male *Tadarida brasiliensis* was captured. By 12:30 A.M. the temperature was 55°F., becoming progressively cooler throughout the morning. At 1:00 A.M. an old female *Tadarida brasiliensis* was taken, and an adult male *Antrozous pallidus* was captured at 4:00 A.M.

Laboratory Studies.—The *Euderma* captured the morning of August 20 had a gentle disposition, did not seem to resent handling, and made no effort to bite or escape. It rarely uttered audible vocal sounds in captivity. By that afternoon the bat had been placed in a cage within a room maintained at about 86 degres Fahrenheit. The following day the bat consumed five mealworms, increasing this to sixteen mealworms a day on the days that followed. On August 22 the bat was photographed in an adjacent room. On August 27 it was found dead on the floor of its cage. Autopsy revealed the bat was molting. Testes were in the inguinal ring and measured 2 by 4 mm. in size. This bat was negative for rabies. It was made into a skin, field number C1137, and is now in the care of the Southwest Rabies Investigations Station.

The *Euderma* captured September 17 had an unpleasant disposition, biting and fighting desperately when handled and scolding with continuous utterances similar in sound to a somewhat run-together "tic-tic-tic-tic." This vocalizing was stimulated even as one would walk past the bat's cage. Its rectal temperature, taken with a Schultheis thermometer, was 26.4° C. after the bat had remained motionless for an hour at a room temperature of 25.4° C. After remaining in a refrigerator for two hours, the bat's rectal temperature was 8.9° C., when the temperature of water in the bottom of a small bottle, kept in the refrigerator, was 8.8. In its artificially-induced state of torpidity, the bat's enormous ears assumed a position also seen during periods of slumber at room temperatures: curled laterally and downward over the forearm, continuing medially and then upward until the distal end of the ear lay in a position between the forearm and the head. At other times, during light naps or when resting at room temperature, the ears either failed to encircle the forearms or were in positions intermediate between the completely "rolled" state and the erect position assumed

in flight, when the medial ear margins touched for about half their length. The first guano pellets eliminated by this bat following capture were saved for studies of the natural diet. They consisted of moth particles (Ross, 1961). This bat responded at once to the routine diet of mealworms and vitamin drop supplement. However, on November 6, 1958, it failed to eat and was found dead the following day, still hanging from the top of its cage. Autopsy revealed no evidence of molt. The testes, measuring 2 by 4 mm., were in the inguinal ring. The liver was unusually pale, and the lungs contained irregular and widely disseminated areas of hemorrhage. This bat was negative for rabies. It was made into a skin, field number C1175, and it is now in the mammal collection of the University of New Mexico, Albuquerque.

Tadarida molossa is more difficult to adapt to life in captivity than is *T. brasiliensis*. It reacts to handling with wild struggles to escape and by biting. These bats were subjected to a captivity program successfully employed on a smaller scale in *T. brasiliensis* (Constantine, 1952). They never learned to feed themselves, and the young bats died within several weeks. Although many of the bats learned to accept mealworms when these were placed in their mouths, a greater number were fed with great difficulty. The mealworm diet was supplemented by vitamin drops, but eventually the oral mucosa, especially the gums, would bleed at the slightest irritation. Upon autopsy several bats showed ascites, pneumonic lesions, and enlarged, yellow, friable livers. An associated purulent conjunctivitis disappeared when strict sanitary procedures were imposed. Many bats broke their own humeri while struggling to avoid hand restraint. By November 18, all but twelve had died. By February 1, 1959, only three were left. At that time their gums bled when gently rubbed with a wetted cotton swab. They were sacrificed in experiments shortly thereafter. All specimens were saved as skins, skeletons or in formalin and distributed to various institutions, including University of New Mexico, Texas A&M College, Harvard University, California Academy of Sciences and Los Angeles County Museum. Most of them were decomposed when it was discovered they had died, so rabies infection rate could not be determined. The Southwest Rabies Investigations Station tested thirty-one netted bats and two moribund bats for rabies by the mouse inoculation test, and whereas tests on thirteen of the former and one of the latter showed the possible presence of rabies, in each instance the suspect agent could not be perpetuated or reproduced in subsequent mouse passage. Thus, it was not possible to confirm rabies infection by the neutralization test. The state laboratory reported rabies-positive mouse

inoculation tests representing two of the moribund *T. molossa* found August 9 and another retrieved from the mouth of a dog on August 17. However, the agents were not subjected to final confirmation by the neutralization test and the diagnosis of rabies must be considered tentative. The Southwest Rabies Investigations Station has since confirmed the presence of rabies by the specific neutralization of an agent isolated from a moribund immature female *T. molossa* from another part of the state.

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NOTES

THE GRASSLAND COMMUNITIES ON THE BAUM LIMESTONE IN JOHNSTON COUNTY, OKLAHOMA—The Baum limestone, as described by J. R. Wayland (Amer. Assoc. Petr. Geol. Bull., 38: 2400, 1954), refers to the basal member of the Paluxy formation of the lower Cretaceous period. Five outcrops of this formation occur between Ravia and Mannsville in southwestern Johnston County, Oklahoma. These chalky outcrops can be seen for several miles and constitute a striking feature of the landscape. Throughout much of the area, erosion has cut this limestone into low irregular mounds, designated as mesas by J. R. Wayland and W. E. Ham (Okla. Geol. Surv. Circ. No. 33, 1955). These mesas range from ten to forty feet in height above the other formations of the area. Most of the mesas are characterized by a flat top, an eroding brow, eroding and stable slopes and an aggrading apron near the base.

An extensive reconnaissance was made throughout the entire region of Baum limestone outcrops in order to find a representative area for vegetational analysis. The area finally chosen was a mesa about 600 feet wide and 2000 feet long in sections 18 and 19, T4S, R3E. In sampling, a total of 135 quadrats, of 0.1 square meter each, were utilized, with a minimum of 20 quadrats in any given stand. Data were secured for frequency and cover as described by R. W. Kelting (Ecology 35: 200, 1954). From these data, actual frequency, relative frequency, areal cover and relative cover were calculated. Since all four parameters indicated about the same thing, only relative cover is presented here (Table 1). The columns are arranged

TABLE 1

Relative cover of the grassland species in diverse habitats of the Baum limestone

Species	Brim and eroding slope	Top and stable slope	Alluvial apron
Oenothera missouriensis var. oklahomensis	13.2	...	...
Bouteloua hirsuta	33.3	14.7	0.7
Hedyotis nigricans	11.6	5.4	1.7
Andropogon scoparius	27.1	76.3	69.8
Cyperus sp.*	...	1.7	2.2
Sorghastrum nutans	...	...	7.7
Others	14.8	1.9	17.9

* No fruiting specimens of this species were found.

from the most xeric to the relatively mesic (left to right). All plant names are listed according to U. T. Waterfall's Keys to the Flora of Oklahoma (1960). It will be observed that four species constituted most of the cover in the most xeric habitats. (Table 1). These species comprised the hairy grama, *Bouteloua hirsuta* (a short grass), and the little bluestem, *Andropogon scoparius* (a mid grass) as the major dominants. Despite these dominants, the xeric habitats (left column) were charac-

terized by a predominance of forbs. The intermediate habitats were occupied mainly by the mid grass, *Andropogon scoparius*, whereas the mesic alluvial apron was dominated by *Andropogon scoparius* and the tall grass, *Sorghastrum nutans*. This sequence of plants represents a cline, or continuum, from a mixed prairie through a midgrass prairie to an incipient tall grass prairie (Table 1).

In that portion of the Baum limestone where the vegetation was analyzed, small communities of woody plants occurred in sheltered places and, in particular, on the alluvial apron. These communities comprised *Fraxinus americana* and *Juniperus virginiana* as the predominant trees and *Lonicera albiflora*, *Prunus angustifolia* and *Rhus aromatica* as the important shrubs. Forest communities were observed on all the other geological formations in the area. The scrubby blackjack-post oak forest was common on the uplands whereas mesic oak and sycamore-willow communities occurred along temporary streams and in the stream valleys.

The xeric habitats (brim and eroding slope) comprised a total of only 23 species despite the presence of many forbs. The intermediate areas included 54 species and the mesic alluvial apron comprised a total of 60 species. The total floristic list of 74 species on the Baum limestone included 15 species of woody plants, 49 forbs and only 10 grasses.

ACKNOWLEDGMENTS

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CHROMOSOME NUMBERS FOR THREE UNITED STATES SPECIES OF XYRIS (XYRIDACEAE).—A cursory survey of the Order Farinosae (sensu Engler and Diels, *Syllabus der Pflanzenfamilien*, ed. 11, 1936) shows that eight out of a total of thirteen families are void of cytological data. In the remaining five, chromosome numbers are known for one species in each of the families Flagellariaceae and Rapateaceae, three species in the Eriocaulonaceae, and only in the Bromeliaceae and the Commelinaceae are there numerous records. Perhaps no other order of flowering plants comparable in size lacks cytological data to such an extent. It seems to me that here exists a fertile area for research not only because of an obvious gap in our knowledge, but because the order is not phylogenetically homogeneous (see treatments by Hutchinson, *Families of Flowering Plants* 2, 1934, and Malme, *North American Flora* 19, 1937) and the findings in cytology might contribute much to a fundamental understanding of the complex.

This note, however, is intended only to give the chromosome numbers for three species of *Xyris* native to the southern United States: all in the section *Euxyris*, all diploid in number, and all unibasic with $x = 9$ chromosomes. These are the first records for the genus and the family.

X. difformis Chapm. $n = 9$. TEXAS. Rusk Co. 3.1 miles north of Cushing. *Lewis & Oliver 5285.*

X. platylepis Chapm. $n = 9$. FLORIDA. Levy Co. 11 miles northwest of Dunnellon. *Stripling 878.*

X. platylepis Chapm. $n = 9$. FLORIDA. Marion Co. 8 miles east of Ocala. *Stripling 847.*

X. cf. *torta* Sm. $2n = 18$. TEXAS. Nacogdoches Co. 3.5 miles south of Nacogdoches. *Lewis & Stripling 5291.*

Specimens filed in our herbarium (ASTC) are annotated by Dr. Robert Kral, Virginia Polytechnic Institute, Blacksburg. The identity of one individual, here given as *X.* cf. *torta* Sm., is questionable and may represent a taxon new to the genus.

As I have pointed out, the data in related genera are negligible. The basic chromosome number of $x = 9$ is known for one species of *Eriocaulon* as well as for several species in the more distantly related *Aregelia, Bielbergia,* and *Cryptanthus* (Bromeliaceae). Little significance can be attached to these similarities until more chromosomal research is completed.—*Walter H. Lewis, Stephen F. Austin State College, Nacogdoches, Texas.*

Figures. 1–3. Meiotic chromosomes of Xyris. Fig. 1.—X. difformis, 9_{II}, Lewis & Oliver 5285. Fig. 2—X. platylepis, 9_{II}, Stripling 847. Fig. 3—X. platylepis, 9_{II}, Stripling 878. Chromosomes drawn with the aid of a camera lucida at ×2300.

A CYTOLOGICAL NOTE ON *HELIOTROPIUM ANGIOSPERMUM* MURRAY.—*Heliotropium angiospermum* Murray is a weedy species distributed in the tropics of the New World. In the United States it extends into Texas and Florida. The plants of this species were collected at Cienfuegos, Cuba. Flower buds were preserved in Carnoy's fixative, Herbarium sheets are deposited at the Herbarium of Atkins Gardens, Cuba.

The chromosome number of this plant was found to be $n = 13$. Chromosome pairing at metaphase I was regular except that occasionally 12 bivalents and 2 univalents were noticed.—*Shamim A. Faruqi, Oklahoma State University, Stillwater, Oklahoma.*

IPOMOEA SHUMARDIANA (CONVOLVULACEAE), A NEGLECTED OKLAHOMA-NORTH TEXAS ENDEMIC.—In H. D. House's "The North American species of the genus *Ipomoea*" (Ann. N.Y. Acad. Sci. 18 no. 6 pt. II: 186, 1908), the Mexican *I. longifolia* Benth. is said to occur on "prairies and plains, Oklahoma and Texas to Arizona and south in Mexio to Queretaro and Durango." Oklahoma and Texas specimens at S.M.U. and the University of Texas so named plainly differed from *I. longifolia* in having rhombic- to ovate-lanceolate leaf blades widest close to base instead of oblong-lanceolate and widest at middle or between middle and base, and smaller calyx (10–15 mm. long vs. 18–23 mm.) and corolla (5–7 cm. vs. 7–10 cm.). Specimens at the University of Texas were determined by the late Dr. Carlos O'Donell as *I. pandurata* (L.) G. Meyer, which species they closely resemble in calyx and corolla size (unfortunately no information on flower

color is available), and approach in leaf shape. But the blades are rounded to cuneate at base, instead of rounded-truncate to cordate, and are consistently much narrower (1.5–3.0 times as long as wide instead of 0.8–1.5 times). In addition the so-called *I. longifolia* occurs entirely outside (northwest) of the known range of *I. pandurata* (as well as far to the northeast of that of true *I. longifolia*). The plants were described long ago as *Ipomoea Carletoni* Holzinger, Contrib. U.S. Nat. Herb. 1: 211, 1892. Holzinger overlooked a still older name, *Convolvulus Shumardianus* Torrey in Marcy, Expl. Red River of Louisiana, p. 278, 1854. Recognition of the plants as a distinct species, which I believe is in order, requires the adoption of the earlier name, as *Ipomoea* **Shumardiana** (Torrey) Shinners, comb. nov., based on the preceding. The following specimens have been examined.

OKLAHOMA. Logan Co.: Guthrie, *M. A. Carleton 472* (US: holotype of *I. Carletoni*, sheet no. 47176; isotype, sheet no. 1275748). Murray Co.: 2.3 miles west of Davis, *Charles A. Holden, Jr., 132* (TEX). Payne Co.: Stillwater, *F. A. Waugh 368* (US), *Darwin Gruver 30* (TEX); ½ mile southwest of Stillwater, *Frank B. Cross 82* (TEX); 2 miles east of Stillwater, *Mavis Reid 26* (SMU); 3 miles east of Stillwater, *Robert Stratton 198* (SMU); 7 miles east of Stillwater, *C. P. Puckette 104* (SMU). County not determined: Mt. Shewlen (? not legible), in field, *Van Vleet*, no further data (US, sheet no. 1242637).

TEXAS. Cooke Co.: Red River, without exact locality, *R. W. Strandtmann*, 26 July 1941 (TEX).

I am indebted to Dr. B. L. Turner for the loan of material from the University of Texas Herbarium, and to Drs. Lyman B. Smith and Velva E. Rudd for the loan of U.S. specimens determined as *I. longifolia* in the U.S. National Herbarium, including type material of *I. Carletoni*. Collections from Arizona and New Mexico appear to be correctly referred to *I. longifolia*, though consistently of a quite narrow-leaved form.—*Lloyd H. Shinners, Southern Methodist University, Dallas 22, Texas.*

TRAGIA NEPETAEFOLIA VAR. LEPTOPHYLLA INSTEAD OF VAR. RAMOSA (EUPHORBIACEAE).—In my *Spring Flora of the Dallas-Fort Worth Area, Texas*. I used the name *Tragia nepetaefolia* Cav. var. *ramosa* (Torr.) Muell.-Arg. for the common prairie nettle of central Texas. But Torrey described *T. ramosa* and a variety *leptophylla* at the same time, and when treated together as a variety of the Mexican *T. nepetaefolia*, the latter epithet has priority, being the oldest one used in the rank of variety. It is therefore necessary to publish the following: *Tragia nepetaefolia* var. **leptophylla** (Torrey) Shinners, comb. nov., based on *T. ramosa* var. *leptophylla* Torrey in Emory, Rept. U.S. & Mexican Boundary Survey vol. 2 pt. 1: 201. 1859.—*Lloyd H. Shinners, Southern Methodist University, Dallas 22, Texas.*

OBSERVED ANOMALIES IN STREPTOCEPHALUS ANOSTRACA.—Relatively few records concerning the occurrence of anomalous appendages in the Anostraca have been published. In 1953, Dexter (Amer. Midl. Nat., 49: 751–771) reviewed this subject and described several additional cases. Later, Moore (Trans. Amer. Microsc. Soc., 76: 159–173, 1957) described anomalies of the male second antennae of laboratory cultured *Streptocephalus seali* Ryder 1879. He stated that the only other anomaly on record for this species involved the cercopods rather than the second antennae. Since so few anomalies in the streptocephalids have been reported, the following observations are presented.

On October 29, 1960, one female bearing large malelike second antennae was

found in a sample of 22 *Streptocephalus texanus* Packard 1871 taken from a roadside ditch 5.5 miles east of Caldwell, Kansas. All other individuals in this sample, 13 males and 8 females, appeared normal. The right second antenna of the specimen in question consisted of a basal segment bearing a tusklike apical branch and a bifurcated distal outgrowth (Fig. 1A). The anterior division of the distal outgrowth of the right antenna was divided into two parallel "fingers", while on the left antennae this division tapered to a single "finger". The posterior division of each antenna was slightly curved and bore two small proximal elevations along its anterior margin. An egg sac extended posteriorly to the end of the fifth abdominal segment and contained 93 eggs. There was no evidence of testis formation.

The above ditch was visited again on December 26, 1960, but fairy shrimps were not present. However, two interesting cases of anomalous structures were discovered in a sample of 7 *S. seali* taken from a prairie drainage ditch located one mile south and 1.2 miles east of Corbin, Kansas. One male, 13 mm. in length, possessed a conspicuous hollow outgrowth from the base of the right mandible; the structure was 4 mm. long and was directed anterio-ventrally. The presence of this outgrowth had apparently forced the right mandible anteriorly so that the distal serrated ends of the mandibles did not mesh. The second case involved the cercopods and abdomen of an immature female. The two terminal abdominal segments were forced laterally by a relatively large saclike structure (Fig. 1B). The gut was bifurcated, one branch terminating at the anal opening between the rami of the cercopods and the other ending blindly in the abnormal outgrowth.

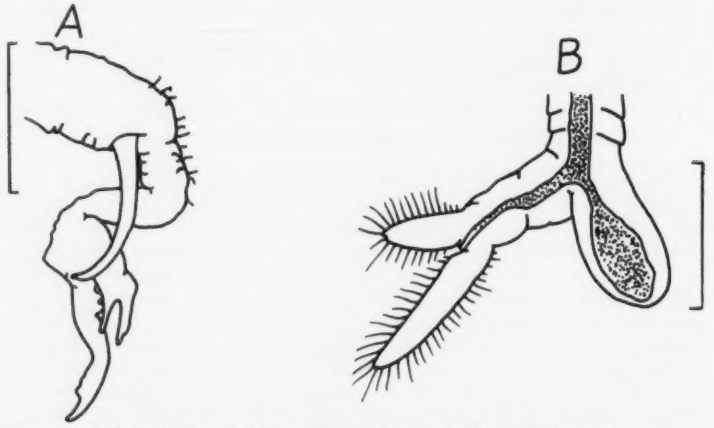

Figure 1. A. Lateral view of right malelike antenna of a female *S. texanus*.
B. Anomalous cercopods and abdominal outgrowth of a female *S. seali*.
(Scale—1 mm.)

Anomalies of the compound eyes of laboratory cultured *S. seali* have also been observed. The left compound eye of one female was vestigial while the right compound eye appeared normal. Another female was observed on which both compound eyes were entirely lacking.

The author is presently a National Science Foundation Science Faculty Fellow (Fellowship 60118) at the University of Oklahoma, for which aid acknowledgment is gratefully extended.—*Carl W. Prophet, Norman, Oklahoma.*

NEW AVIAN HOST RECORDS FOR SOME MESOSTIGMATID NASAL MITES.

Larinyssus orbicularis Strandtmann

Thallasseus maximus (Boddaert), royal tern, is a new host for *Larinyssus orbicularis*, a mite apparently specific to the family Laridae. Of two birds examined, one was parasitized by six female and three male mites. The tern was collected on September 27, 1960, along the Gulf Coast between Sabine Pass, Texas, and High Island, Texas.

Sternostoma boydi Strandtmann

Calidris canutus (Linnaeus), knot, is a new host for *Sternostoma boydi*, a mite apparently specific to the order Charadriiformes. Four of the seven knots were parasitized as follows: Two mites, both females; two mites, male and female; four mites, all females; 12 mites, one male and 11 females. The knot was collected on September 27, 1960, along the Gulf Coast between Sabine Pass, Texas, and High Island, Texas.

Sterna forsteri Nuttall, Forster's tern, and *Totanus melanoleucus* (Gmelin), greater yellowlegs, are also new hosts for *S. boydi*. The tern, collected on October 10, 1959, five miles south of Beaumont, Texas, had one female mite; and the greater yellowlegs, collected on January 30, 1960, at Smith Point, Texas, had four female mites.

Sternostoma strandtmanni Furman

Cassidix mexicanus (Gmelin), boat-tailed grackle, is a new host for *Sternostoma strandtmanni*, a mite probably specific to birds of the family Icteridae. A single bird, collected November 22, 1959, at Smith Point, Texas, had 63 mites, all females. Furman (1957. Hilgardia 26: 473–495) illustrates the idiosoma of this mite as having an ovoid outline when viewed dorsally or ventrally with the broad end anterior. Many of the mites from the grackle also show this outline. Some, however, are exceptional in that the idiosoma is much larger and is shaped differently than in those with the ovoid outline. In fact, in some of the specimens the tarsi of the outstretched legs II, III, and IV barely extend beyond the margin of the idiosoma. In Furman's illustrations and in the ovoid mites from the grackle the coxae or, at most, the trochanters of all legs extend beyond the margin. The larger idiosoma is somewhat angular suggesting a kite with bluntly rounded corners, the broad end anterior. So distinctive is this outline that it was noted during removal of the mites from the nasal chambers. This shape may result from complete distention of the gut with blood.

Rhinonyssus coniventris Trouessart

Squatarola squatarola (Linnaeus), black-bellied plover, and *C. canutus*, knot, may be added as new hosts for *Rhinonyssus coniventris*, a mite apparently specific to the charadriiform families, Charadriidae and Scolopacidae. One black-bellied plover contained a single female mite. Of the seven knots, one contained a single female mite.

This mite is known to vary slightly depending upon the host species. One of the most recognizable variations is the manner of dorsal sclerotization. This is somewhat similar in each of these specimens and corresponds closely to Strandtmann's

description of the dorsal sclerotization of specimens from *Charadrius alexandrinus* Linnaeus, snowy plover, and *Arenaria interpres* (Linnaeus), ruddy turnstone (Strandtmann, 1956. Proc. Entom. Soc. Wash. 58: 129–142).

Dorsal sclerotization in both mites consists of three pairs of separate, irregularly shaped platelets. The medial separation of the members of each pair increases from anterior to posterior. In the mite from the black-bellied plover the posterior pair of platelets is the largest; in the mite from the knot the second pair is the largest. In the mite from the black-bellied plover there is also a group of very small platelets situated medially between the first and second pairs of platelets. In the mite from the knot a similar group of platelets lies medially between the platelets of the first pair, and four very small platelets lie anterior to each of the first platelets. The black-bellied plover was collected on February 7, 1960, and the knot on September 27, 1960, aong the Gulf Coast between Sabine Pass, Texas, and High Island, Texas.

Neonyssus belopolskii Bregatova

Butorides virescens (Linnaeus), green heron, is a new host for *Neonyssus belopolskii*. Of three birds collected September 17, 1960, 20 miles southwest of Beaumont, Texas, one contained five females, eight males, and 1 male nymph (deutonomph molting to adult male). *N. belopolskii* is probably specific to the family Ardeidae, although it is not the only species of *Neonyssus* parasitic in these birds.

The specimens from the green heron vary slightly from the descriptions and illustrations of *N. belopolskii* by Bregatova (1950. Rept. Acad. Sci. U.S.S.R. 71: 1005–1008) and those of Zumpt and Till (1955. Jour. Entom. Soc. S. Africa 18: 60–92) of *N. ardeae*, a synonym of *N. belopolskii*, (Strandtmann, 1956. Jour. Kansas Entom. Soc. 29: 133–138). The differences, however, do not warrant the description of a new species, especially in view of the known variability of some species of mesostigmatid nasal mites. The specimens of *N. belopolskii* of Bregatova and Zumpt and Till have opisthosomal plates with nearly parallel lateral margins. The opisthosomal plates of the present specimens all have a distinct, regular trapezoidal form; the longer parallel dimension is anterior. This form corresponds closely to the opisthosomal plate of *N. ixobrynchi* Fain (1957. Roy. Congo Belge Tervuren Ser. 80, Zool. 60: 176 pp.). The podosomal plates are also similar. *N. ixobrynchi*, however, possesses a small sternal plate not present on the specimens from the green heron. Thus, the green heron mites are distinctly a species other than *N. ixobrynchi*.

Strandtmann has a single specimen of *N. belopolskii* from a green heron collected by R. O. Albert on June 6, 1954, at Malabu, Florida. He has not previously cited this host record. The opisthosomal plate of this mite shows the precise characteristics of those of the present specimens.

Mites identified as *N. belopolskii* have also been found in *Hydranassa tricolor* (P.L.S. Muller), Louisiana heron, a previously reported host for the mites.

Two of four birds examined were infested; one had a male and a female, and the other had six female mites. These mites show slight differences from the other mites described as *N. belopolskii*. The opisthosomal plates of these mites have strongly eroded lateral margins. This fails to correspond with previously described specimens of *N. belopolskii*.

Several specimens of *N. belopolskii* obtained by Strandtmann from a Louisiana

heron collected at Aransas Pass, Texas, March 23, 1951, show opisthosomal plate characteristics identical with the present specimens.

Large numbers of mites from many species of birds in the Ardeidae would be desirable in establishing the true identity and relationships of mites now identified as *N. belopolskii*. However, such a study would be met with difficulty since the percentage of infestation of this mite in birds in the Ardeidae seems low. Only four of 30 birds in the Ardeidae examined have yielded mites. Birds collected and examined include *Butorides virescens* (Linnaeus), green heron; *Hydranassa tricolor* (P.L.S. Muller), Louisiana heron; *Ardea herodias* Linnaeus, great blue heron; *Casmerodius albus* (Linnaeus), American bittern; *Florida caerulea* (Linnaeus), little blue heron; *Florida thula* (Molina), snowy egret; *Nycticorax nycticorax* (Linnaeus), black-crowned night heron; *Ixobrynchus exilis* (Gmelin), least bittern; *Botaurus lentiginosus* (Rackett), American Bittern; and *Bubulcus ibis* (Linnaeus), cattle egret. The infested birds were the previously mentioned green heron and Louisiana heron and also a single cattle egret. The mites from the cattle egret are identified as *N. bulbuci* Zumpt and Till, as originally described from this bird (Zumpt and Till, 1955).

Not only is the species *belopolskii* in need of additional investigation, but also the genus *Neonyssus* itself, as there are several species from entirely unrelated host birds assigned to the genus.

All host records in the order Ciconiiformes are in the family Ardeidae. Of great interest will be the mites infesting the birds of the families Ciconiidae and Threskiornithidae if, indeed, such infestations do occur and are found and reported. Birds in these families which have been obtained in these collections include *Mycteria americana* (Linnaeus), wood ibis; *Plegadis chihi* (Vieillot), white-faced glossy ibis; *Eudocimus albus* (Linnaeus), white ibis; *Ajaia ajaja* (Linnaeus), roseate spoonbill. None was infested.

For their assistance in the collection of birds, appreciation is expressed to A. E. Duwe, Charles Edwards, Jib Bob Jackson, Russell J. Long, William Rhodes, Roger Shoemake, and Joe Whitehead.

This work was supported by a grant from the Research Committee of Lamar State College of Technology, Beaumont, Texas.—*Robert W. Mitchell, Lamar State College of Technology, Beaumont, Texas.*

NOTES OF SOME AMPHIBIANS AND REPTILES FROM EASTERN TEXAS.—Judging from the carefully prepared maps in Conant's Field Guide to Reptiles and Amphibians (1958), some specimens of amphibians and reptiles from eastern Texas seem noteworthy in constituting extensions of known geographic ranges. The nearest specific localities known hitherto are in Brown's Check List of the Reptiles and Amphibians of Texas (1950), unless otherwise noted. All numbers refer to specimens in the collections at Stephen F. Austin State College, Nacogdoches, Texas (SFA), except some specimens of *Eumeces anthracinus* (indicated by LC), which are in the private collection of Lawrence Curtis, Fort Worth Zoo. We are indebted to Mr. Curtis for permission to report these lizards. Measurements are of snout-vent lengths.

Bufo valliceps Wiegmann.—Nos. 1177, La Nana Creek, 1.5 mi. E Nacogdoches, and 752, Nacogdoches, Nacogdoches Co. Two specimens, 63 and 75 mm., represent a slight northeasterly extension of range, and enforce the isolated record in southern

Arkansas (Smith and Langebartel, Copeia, 3:230, 1949). The species seems to be not as abundant as *Bufo woodhousei*. Both specimens were taken in a rainy period.

Pseudacris streckeri streckeri Wright and Wright.—Nos. 465–77, 482–96, Nacogdoches, Nacogdoches Co. The 28 specimens (23 males, 5 females) extend the range of the species eastward; the largest female measures 36 mm., and the largest male 35 mm. The dorsal dark marks are round or elongate and sometimes indistinct. There is usually a dark interorbital mark, barring on limbs, and a dark stripe from nostril through tympanum that is not continued on the sides of the body as a distinct series of spots. The species is common near Nacogdoches; breeding congresses have been observed on January 19 and 21 beside a pond 6 mi. SW Nacogdoches.

Rana areolata areolata Baird and Girard.—No. 358, 2 mi. W Ratcliff, Houston Co. A female, 78 mm., which was found on the edge of a large lake, is of interest because of the apparent secretiveness of this frog in southeastern Texas (Brown, *op cit.*: 71), and the indicated disjunct distribution of the subspecies (Conant, *op. cit.*:351, map 242).

Phrynosoma cornutum (Harlan).—Nos. 341, 790, 1179, 1181, Nacogdoches, Nacogdoches Co.; 1180, Carthage, Panola Co. Five specimens are from residential areas. Comments of local residents that they "don't remember seeing any 10 to 15 years ago", suggest that the species has been introduced. Other records from Bowie Co., Texas (Brown, *op. cit.*:97; Reeve, Univ. Kansas Sci. Bull., 34(14):903, 1952), southern Arkansas (Dowling, Occas. Pap. Univ. Arkansas Mus., 3:20, 1957; Dellinger and Black, *ibid*, 1:11, 1938) and De Soto Parish, Louisiana (Strecker and Frierson, Contr. Baylor Univ. Mus., 5:7, 1926) seem to have resulted from introductions.

Sceloporus olivaceus Smith.—No. 1441, 3 mi. S Cushing, Nacogdoches Co. A female, having 32 dorsal scales and measuring 92 mm., was obtained by Mrs. William Lyle on December 14, 1960. Our specimen substantiates the published record of occurrence for Smith County, Texas (Burt, Pap. Michigan Acad. Sci., Arts and Letters, 22:536, 1937), which is questioned by Conant (*op. cit.*:320, map 46), and extends the geographic range of the species into eastern Texas.

Eumeces anthracinus pluvialis Cope.—Nos. 1154–55, 4 mi. S Timpson, Shelby Co.; 1178, 10 mi. S Nacogdoches, Angelina Co.; LC 1111–13, Ferndale Lake, 8 mi. E Pittsburg, Camp Co.; LC 1152–57, 7 mi. NE Quitman, Wood Co. There are four published records of this species in Texas (Bowie Co., Smith and Smith, Univ. Kansas Sci. Bull., 34(11):689, 1952; Angelina Co., Tinkle and Curtis, Field and Lab., 19(2):85, 1951; Bowie and Upshur cos., Brown, Herpetologica, 7:72, 76).

Our 12 specimens agree with the diagnosis of this subspecies by Smith and Smith (*op. cit.*:686) in having black-bordered, pale supralabials, 28 (100%) scale rows at midbody, and seven (100%) supralabials. Faint, pale middorsal strips occur in four specimens, and all have at least a semblance of narrow rows of black dots bordering the medial edge of each narrow, pale dorsolateral line. There are 48–54 (average, 51.2) middorsal scales. The largest specimen (SFA 1178) is a female measuring 67 mm.; the largest male (LC 1113) measures 60 mm. One male (LC 1155), measuring 50 mm. and captured on March 23, 1951, is sexually mature (many sperm present in smear of testis which measures 3 by 6 mm.). The specimens from 4 mi. S Timpson, Shelby Co., were collected by Mr. Ray D. Burkett beside a small spring-fed stream in the top leaf litter in a hackberry stand. The specimen from

10 mi. S Nacogdoches was obtained by R. L. Packard under leaf litter of water oak in bottomland of the Angelina River.

A grant-in-aid from the Texas Academy of Sciences provided funds for certain aspects of field work that led to the collection of some of the specimens herein reported.—*Robert G. Webb, Museum of Natural History, The University of Kansas, and Robert L. Packard, Stephen F. Austin State College, Nacogdoches, Texas.*

WINTER CONCENTRATION OF BALD EAGLES AT GRAND LAKE, OKLAHOMA.—In Oklahoma the Bald Eagle, *Haliaeetus leucocephalus*, congregates during winter about impoundments at the Wichita Mountains Wildlife Refuge, Comanche County (Halloran, Arthur F., 1960, Proc. Okla. Acad. Sci., 40: 120–121) and at the Salt Plains National Wildlife Refuge, Alfalfa County, and occasionally about other large bodies of water. A systematic study of the winter ecology, behavior, and roosting habits of this species at Grand Lake, Ottawa County, is now being conducted (M. S. thesis problem). The present note concerns observations from the two previous winters.

In February, 1959, while in northeastern Oklahoma to secure specimens of woodpeckers for the Museum of Zoology at Kansas State College of Pittsburg, M. L. Wiley, R. J. Mangile, and I discovered a sizable winter roost. On the afternoon of February 6 we watched twenty eagles (no fewer than five with white heads and tails, no fewer than eight in immature plumage) fly into a roost area in a double inlet of the lake at least a mile from the nearest human habitation. The birds alighted initially in living pine trees and on exposed dead limbs of other trees, 100 to 200 feet higher than the water surface. The following morning we were in position before dawn to observe the eagles as they left the roost area and spread out over the main body of the lake for the day; the temperature at 4:30 a.m. was 35° F. The first indication of activity, at 6:35 a.m., was a short series of "cackling" notes, followed immediately by flight of the first eagle away from the roost. By 7:00 a.m., before the sun had come into our view or had fallen upon the trees of the roost area, we counted 65 eagles as they flew through the neck of the inlet; others may have crossed overland to another arm of the lake not in our range of vision. The birds departed as individuals, not in groups; at the height of the exodus, we saw twelve eagles simultaneously in the air.

On February 11, 1959, T. M. Sperry, D. G. Johnson, myself and members of my Ornithology class observed the roost area for an hour in late afternoon. At 5:15 we counted twenty-two eagles already perched in trees; no fewer than fifteen of these were in adult plumage. Other eagles may have been present which we could not see from our vantage point about one-third mile across the inlet. By 6:10 we watched sixteen immature birds and six adults flying into the roost area, many passing within 50 to 100 feet directly above us. So far as we were able to determine, the last eagle arrived by 6:15.

On December 5, 1959, Wiley saw at least ten eagles at Grand Lake, but none was yet utilizing the roost area of the previous winter. He reported a minimum of six eagles in trees of the roost area on January 6, 1960. On March 11, 1960, B. F. Cooksey observed eagles coming into the roost as follows: one at 5:05; one at 5:07; one at 5:08; two at 5:15; two at 5:25; two at 5:30; two at about 5:34; eight between 5:35 and 6:05 p.m.

In the fall the birds begin to arrive at Grand Lake in late October or early November, but do not, so far as we know, start communal roosting before December. The build-up in numbers using a common roost area occurs during December, and

the eagles continue to utilize the roost area until late February or early March. The number of eagles spending the winter at Grand Lake may vary considerably from year to year. Eagles are not known to nest at Grand Lake.—*J. C. Johnson, Jr., Kansas State College, Pittsburg.*

NEW LOCALITY RECORDS FOR SOME OKLAHOMA MAMMALS.—The geographic distribution of many of the mammalian species of Oklahoma is poorly known. This is particularly true of mammals of southern and eastern Oklahoma. The Oklahoma records of Hall and Kelson (Ronald Press, Vols. 1 and 2: 1–1 1083, 1959) are based largely on the distributions reported by Blair (Amer. Midl. Nat., 22: 85–133, 1939) twenty-two years ago. The present paper is a report of the geographic occurrence of seven species of Oklahoma mammals, the ranges of which are inadequately shown in current literature records.

The geographic distribution of the short-tailed shrew *(Blarina brevicauda carolinensis)* in Oklahoma was recently discussed by Jones and Glass (Southwest. Nat., 5: 136–142, 1960). They noted the apparent absence of the species in the southern and eastern parts of the Osage Savanna biotic district. Additional occurrences of *Blarina* in this biotic district should be placed on record. In the summer of 1959, one adult female *Blarina brevicauda* was collected six miles southwest of Kingston, Marshall County, on the Shay crossing of Buncombe Creek, Lake Texoma. In August of 1960, another adult female of this species was collected five miles southwest of Colbert, Bryan County, immediately below the Denison Dam. Both specimens were captured under decaying logs in a wooded floodplain community. (See McCarley, Tex. Jour. Sci., 5: 102–112, 1952, for description of floodplain vegetation in this area). Both specimens are now in the uncatalogued collection of the University of Oklahoma Biological Station. In the winter of 1959–60, two adult unsexed specimens of *Blarina* were collected 9 miles southwest of Nashoba, Pushmataha County, and one mile west of Red Oak, Latimer County, by Herbert Upchurch and Edward D. Whitworth. Both specimens were trapped in grassy pastures adjacent to wooded areas. These latter specimens are in the collection of Southeastern State College.

Eastern chipmunks *(Tamias striatus venustus)* have been recorded in southeastern Oklahoma only from McCurtain County (Blair, *op. cit.*). The capture of an adult male two miles east of Daisy, Atoka County, in December 1960, by George Ellis extends the known range of this species in southern Oklahoma 60 miles west of its previously recorded occurrence and to the western edge of the Ouachita biotic district. Sight records of this species have been reliably reported 2 miles east and 12 miles east-southeast of Stringtown, Atoka County, and west of the locality mentioned above. Additional records within the known geographic range of the species indicate that *Tamias striatus* occurs in disjunct populations throughout the Ouachita biotic district in southeastern Oklahoma. The specimen mentioned above is in the Southeastern State College Collection.

Apparently no official reports of prairie dogs, *(Cynomys ludovicianus ludovicianus)* in southern Oklahoma exist for areas east of the Wichita Mountains. The occurrence of a population in Carter County, two miles northwest of Healdton extends the range eastward about 55 miles into a transition area of the Osage Savanna and Mixed-grass Plains biotic districts. This particular colony occupied an area of about 60 acres but the distribution within the area was not continuous. A specimen from this locality was secured 26 November 1960, by Joe Fox. Two additional colonies were also observed to be presently extant in Jefferson County,

four and one-half miles southeast of Ryan. Specimens from both localities are in the Southeastern State College Collection.

The occurrence of rice rats *(Oryzomys palustris texensis)* in southern Oklahoma in the Mississippi and Osage Savanna biotic districts has been previously reported by Whitaker (Jour. Mamm., 18: 102, 1937), and McCarley (1952, *op. cit.* and Jour. Mamm., 41: 130–131, 1960). McCarley (1960, *op. cit.*) suggested that rice rats would ultimately be found to occur in other localities in southern and eastern Oklahoma as the area became more thoroughly investigated. The capture of one specimen each by Herbert Upchurch and Ted Oliphant from nine miles southwest of Nashoba, Pushmataha County, and three miles north of Pittsburg, Pittsburg County, in December 1959, tends to support this supposition and definitely places the species as part of the mammalian fauna of the Ouachita biotic district. Both specimens were secured in wet boggy areas dominated by various species of berry vines, *Smilax*, and tall grasses *(Andropogon)*. The two specimens were placed in the collection of Southeastern State College.

Ochrotomys nuttalli flammeus, the golden mouse, has been recorded in literature from only two counties in eastern Oklahoma; McCurtain County in the southeastern corner of the state and Sequoyah County in the northeastern part. On 23 April 1960, an adult male *O. nuttalli* was collected five miles east of Nashoba, Pushmataha County, from a rocky wooded hillside. This extends the known range of the species approximately 33 miles west of the previous westernmost record in Oklahoma (Blair, *op. cit.*). This specimen was deposited in the University of Michigan Museum of Zoology, Number 110376.

Muskrats *(Ondatra zibethicus cinnamominus)* have been officially recorded in Oklahoma only as far south as Norman, Cleveland County (Hall and Kelson, *op. cit.*). The presence of muskrats at the State Fish Hatchery, five miles north of Durant, Bryan County, was verified by the capture of one half-grown male on 8 January 1961, by Joe Fox and Joe Gary. According to former Hatchery Superintendent, John Murphree, the species has been present in hatchery ponds for about 20 years although it was not recorded in the area by McCarley (1952, *op. cit.*). Murphree states that to the best of his knowledge the muskrats were not artificially stocked in the area but became established through normal dispersal. This record extends the known range of *Ondatra zibethicus* into the southern part of the Osage Savanna biotic district of Oklahoma from which it was previously unrecorded. The skin and skull of the collected specimen were placed in the collection of Southeastern State College.

Black Bears *(Ursus americanus)* were reported by Blair, *(op. cit.)* to be extirpated in Oklahoma. A skull in the Southeastern State College Collection from McCurtain County has a notation on it that the animal was killed in 1915 and represented the last black bear known to be present in that area. On 22 April 1960, however, a young male black bear was killed six miles north of Spiro, LeFlore County by a local resident. The skull of this animal was obtained and is now in the Southeastern State College Collection. The origin of this individual was quite likely the Ozark and Ouachita Mountains of western Arkansas because Sealander (Amer. Midl. Nat., 56: 257–296, 1956) reported bears presently extant in those areas. It was quite likely that the "Spiro bear" represented a dispersing individual from this population, probably utilizing the Arkansas and Poteau river flood plains as dispersal routes.—*Howard McCarley, Austin College, Sherman, Texas.*

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